THE NET-WINGED MIDGES OF EASTERN NORTH AMERICA, WITH NOTES ON NEW TAXONOMIC CHARACTERS IN THE FAMILY BLEPHARICERIDAE (DIPTERA)[1]

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ABSTRACT: The single genus *Blepharicera* Macquart of the family Blephariceridae occurs in eastern North America, probably arriving historically via a continental connection with western Europe, and is now distributed through Appalachia, New England, the northern Great Lakes Region and southeastern Canada. Six species are recognized, discussed and figured: *B. capitata* (Loew), *cherokea* new species, *diminutiva* new species, *similans* (Johannsen), *tenuipes* (Walker), and *williamsae* (Alexander). Six larval types also are known but none definitely can be associated with adults (although three are provisionally identified). Pupal anatomy, with one exception, is homogeneous, defying species characterization.

The usefulness of taxonomic characters in the group is discussed including application of several new terms.

INTRODUCTION

The family Blephariceridae is represented in eastern North America by the single genus *Blepharicera,* in which six species are recognized presently. These species, here designated as the "Tenuipes Group," are extremely similar in all stages and undoubtedly arose from a single ancestral form. *Blepharicera* is now known to occur only in the northern hemisphere, ranging more or less continuously and narrowly across Asia through northern Spain, the Alps and Balkans, Caucasus, Himalayas, to Japan and North Korea. Species also are found disjunctly in northern Borneo, Thailand, Taiwan and neighboring China. This is a so-called "Tethyan distribution" and suggests, within the tenets of plate tectonics, that the genus originated in Laurasia and expanded to the south only as far as the northern margin of the Tethyan Sea.

Introduction to North America could have occurred via Europe-Newfoundland or Bering connections. I favor the former route for the Tenuipes Group because of the total lack of close relatives in western North America. (*B. ostensackeni* may form an exception but it is not clearly a member of this group.)

The western species of *Blepharicera* could have evolved secondarily from a western extension of this stock, but they are an assemblage of distinct species quite unlike the eastern species and I think it much more likely that they arrived independently from one or more introductions over a Bering connection from eastern Asia. This thesis is supported further by the parallel occurrence in western North America of the genera *Bibiocephala* and *Philorus*, both of which have very close relatives in Japan and other parts of Asia. Unfortunately, there is no information on the occurrence of the genus in Alaska and northern and central Canada which could establish continuity between the eastern and western forms.

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The eastern *Blepharicera* are now known from as far west as eastern Minnesota through southern Ontario and all the southeastern Canadian provinces, through New England and down the Appalachian cordillera to its southern extreme in Georgia. Included in this distribution are the Canadian provinces of Quebec, Ontario, Newfoundland, New Brunswick and Nova Scotia, and the American states of Maine, Vermont, New Hampshire, Minnesota, New York, Massachusetts, Connecticut, Pennsylvania, New Jersey, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Tennessee and Georgia. I predict that they may eventually be discovered in extreme northeastern Alabama, eastern Kentucky and possibly Michigan and Manitoba.

This largely congruent distribution and the extreme morphological similarity of all the species has made it impossible, without rearings, to firmly establish associations of the immature with the adult stages. As many as three species can occur at the same locality, so that stages associated in single collections do not necessarily belong to the same species. A further barrier to relating the larvae to the adults is the total homogeneity of pupal morphology. Whereas identifiable pharate adults may be related to pupae by dissection, there is no way to transcend the gap between larva and pupa. The one exception to this is the distinctive form ''F'' with conspicuous median dorsal convexities on the abdomen of larva and pupa. Unfortunately, the one mature form ''F'' pupa available did not yield an identifiable female.

These difficulties have prevented me from definitely establishing stage associations in any species, and all identifications of immatures cited are provisional. Associations can be accomplished with certainty if specimens are individually reared, but this requires special care, time, and equipment. Very probable associations can be established if collecting is extensive and carefully done so that groups of larvae of all instars present, and pupae in close proximity (on the same boulder or area of a large rock face) and in the process of transformation, are preserved apart from other groups. Unfortunately, the material available for this study was totally inadequate for this application. In the taxonomic treatment below, I have relegated larvae to each of the species very tentatively and state my reason, albeit tenuous, for each association. I urge students of stream biology in the East to vigorously and carefully collect this genus so that these vagaries can be removed.

TAXONOMIC CHARACTERS

Larval Chaetotaxy and Cuticular Sclerotizations

In my first attempts to separate the very similar larvae of the various species in this complex, I became aware immediately of the need to utilize new characters. Previously, the chaetotaxy has been almost totally ignored in taxonomic studies of larval

Blephariceridae, and no foundation existed upon which to assess possible useful character states. From the practical standpoint of need for a consistent terminology and to reveal some points for species discrimination, I undertook a preliminary study of the homologies (both serial and comparative between several genera) of the trunk setae; study of the head setae has been deferred.

After examining the first instar larvae of *Agathon comstocki* (Kellogg) (Fig. 1-western North America) and *Neocurupira chiltoni* (Campbell) (Fig. 2 - New Zealand) and later instars of numerous genera, it became apparent that, like those of most nematocerous families, blepharicerid larvae possess so-called primary sensilla which make up the complete complement of the first instar larva and a much larger number of secondary sensilla added in subsequent instars. The latter appear in addition to the primary sensilla after the first molt and continue to proliferate until maturity when the larva may be covered with a dense vestiture. In these later stages this homogeneity and density obscures the recognition of the primary sensilla, but these often retain some distinctive characteristic, such as larger alveolus, occurrence in pairs, darker pigmentation, larger size, association with a tubercle or plate, or unique shape.

These patterns are very constant and follow a basic plan described as follows for all except segments VIII - IX (refer to figures 1 - 2 and 30 for further explanation):

tergal sensilla (t)—most mesal series on the dorsum on all segments. Usually obliterated in later instars by proliferation.

subtergal (st)—next laterad to the tergal sensilla, on all segments. Always distinguishable in later instars by position, setiform shape and large alveolus.

tergopleural (tp)—two sensilla situated far laterad on all segments. Associated with the dorsolateral tubercle or plate in those forms with these structures. A close-set pair of long, setiform sensilla on the meso- and metathorax (although paired, not serially homologous with abdominal "geminate setae").

pre-dorsopseudopodal (pdpod)—in the first instar a single sensillum on the extreme base of the pseudopod on the abdominal segments; an isolated seta on the thorax. In later instars a group of setae on the anterobasal angle of the dorsal pseudopod when this organ is present.

dorso-pseudopodal ("geminate setae") (dpod)—a pair of conspicuous, always large, setiform sensilla on the anterolateral angle of the trunk segments and lateral margin of the cephalic division in instars II-IV; on the dorsal surface of the base of the pseudopod in the first instar. These sensilla are located at the apices of the dorsal pseudopods when this organ occurs and at the apex of the posterolateral lobe of the anal division (which is a dorsal pseudopod anatomically).

pleural (p)—a single seta, variously positioned on the lateral margin. Usually completely obscured by the secondary setae in later instars.

sternopleural (sp)—on the thorax of *Neocurupira chiltoni* a single, heavy seta between the conspicuous ventral substernal and lateral pleural hairs.

substernal (ss)—a large conspicuous seta on the venter of the thoracic segments, laterad of the sucker and minute **sternal** (s) setae.

pedichetal (pd)—This group is contained within the ventral sucker and consists of three minute setae. As shown by Craig (1967: fig. 13 and p. 202) the anteriormost sucker belongs to abdominal segment I, the posteriormost to abdominal segment VI.

Pedichetal sensilla, therefore, appear to be wanting from the venters of the thorax and anal division.

In addition to the relatively large setate sensilla, there are various minute sense organs (**intertergal**-it, **intersternal**-is, **intercalary**-ic), some appearing as minuscule hairlike processes, other as hairless rings (sensilla campaniforme). Their positions are very constant in all instars and species, so they offer little more taxonomically than reference points.

Segments VIII and IX of the anal division are recognizable dorsally by lines of sensilla and sclerites. The complements of both, however, are reduced and the nomenclature just given does not apply strictly. On segment VIII a tergal sensillum remains distinct but the others are grouped into a single pleural group. On segment IX, the terminal segment, only a pair of pleurals are apparent besides the conspicuous **terminal setae**.

Both primary and secondary sensilla may take a variety of shapes, often characteristic of genera and species. On the abdomen of the first instar of the two forms which I have studied, all the primary sensilla are setiform except the tergal (t) and the more lateral of the tergopleurals, both of which are lanceolate or coniform. This is also true of the thorax except for the tergals and intertergals which are coniform and the pleurals which are claviform.

This pattern persists in later larval instars of *Blepharicera*, except that the majority of the dorsal secondary sensilla assume varied coniform, claviform or capitate shapes and arrangements which confer to them diagnostic value.

The function of these organs is unknown. I doubt their sensory importance because of their density. Their dorsal position and the frequent occurrence of specimens with heavy growths of diatoms and algae and even mineral precipitates entangled and attached to them, suggests a function similar to that of the ''tectorial'' setae and spines of psychodid larvae (Vaillant 1959:41), be it to help anchor or hide the animal. The roughened surface produced may also act physically to reduce resistance with the water, like sclerotized projections which could have the same function as suggested by Hora 1930:255. The condition would appear to be specialized and apomorphous since few hairs is the rule in nematocerous and mecopterous larvae.

My study of chaetotaxy remains incomplete, requiring much material now unavailable of first instar larvae of many genera. I am continuing to work on an analysis of the homologies of the sensilla and hope eventually to propose a system of nomenclature useful to morphologists and taxonomists. For the present, I present detailed illustrations of the patterns of sensilla in these few species with only general topographic names for taxonomic reference.

Probably associated with these sensillar modifications is the tendency of many larvae (although not *Blepharicera*) to form dorsal sclerotizations since the positions of the latter generally coincide with the locations of the primary setae. The dorsal pseudopod (as in *Agathon* and *Philorus*) for example, always bears the large paired dorsopseudopodal (dpod) setae at its apex. The blepharicerid taxonomist is advised, however, to homologize such plates, tubercles and other sclerotized processes with great caution because these structures take similar forms in unrelated species and genera.

PUPAL STRUCTURES

With the exception of Species F, I have been unable to discover characters on the pupa which permit species discrimination. Part of the problem is the lack of complete material of all species. This most conservative of life stages shows no divergence of structure, even in detail, among these very closely related Eastern species. Size varies continuously from the smallest, *diminutiva*, to the largest, *williamsae*, so cannot be used as a discrete objective character.

ADULT STRUCTURES

Aside from the number of bristles on the parietal sclerite of the head, which varies from none in most males to up to 50 in females of *williamsae*, there is little in the general anatomy of either sex to reliably distinguish the species.

It should be emphasized that the latter statement is also largely true of size and external body coloration, although these characters formed the basis of Alexander's key (1963:52-53). After trying to reconcile the several hundred adults used in the present study with this key, I have come to the conclusion that coloration in this species group is a character of very limited use because, (1) it varies continuously from species to species (smaller species tending to be paler than larger) and (2) its interpretation is too easily confused by the condition and age of the specimen when killed, presence of grease, and the angle of lighting and viewing. Regarding this last point, I should explain that the integument induces interference phenomena in light rays reflected from it and it displays spectral colors when viewed from oblique angles. Thus, the pigmentary colors are obscured and distorted by other than perpendicular viewing and the thorax seems to change in color from gray to brown as the specimen is rotated under the stereoscopic microscope.

The most useful species characters in this group, as with most nematocerous Diptera, are to be found in the genitalia. In the male the following three character complexes are those applied mainly: (1) shape of the apex and shaft of the parameres; (2) shape of the apices of the penis filaments; and (3) shape of the IXth tergite lobes. All tend to be simpler in the smaller species, a fact which throws some light on the phylogeny of the group by suggesting that size differences may have generated allometric structures that present reproductive barriers (see REMARKS under *diminutiva*).

Genitalic features of the females are less well marked than in the males. *B. similans* is highly distinctive in lacking a normal median spermatheca (correlated with the overly long and apically modified median penis filament in the male) but the number of these organs remains three in all the other forms. Of use primarily are the following characters although even these all seem to be subject to such variation as to make identification of isolated or atypical specimens often impossible: (1) number and distribution of macrochaetae on the VIIIth sternite lobes, (2) shape of the median fold, especially the median basal sclerotization thereof, (3) sclerotizations of the spermathecal ducts.

An additional fairly definitive and constant character is the shape of an organ which

I interpret from gross morphology as the accessory gland. Unfortunately it is sometimes difficult to discern in slide mounts, but when evident its outline takes a variety of consistent forms.

PROCEDURE

All statistics given are means with the range in parentheses. Unless otherwise noted, the sample size for each set of measurements was normally 10 for wings and legs, 2-5 for head structures. Wherever the sample was less than 10 (e.g. *diminutiva*), ranges are not given in the descriptions. Because of the small series available from specific localities, it was usually necessary to take data from mixed populations. Body length of larvae was measured only on prepupal individuals (pupal branchiae visible). Measurements in text and on the figures are in millimeters.

Proportions of leg segments are given as "progressive proportions" meaning that each segment is taken relative to that proximal rather than to one standard segment. This makes comparisons easier and more accurate since the segments are progressively shorter to a small degree or nearly equal in length; greatly differing and disjunct lengths need not be compared to one another.

In the case of antennal segment proportions, the basal flagellar segment is used as the standard since it is more conveniently and accurately measured than either the scape or pedicel which are both globular and difficult to orient consistently.

Material is listed separately for the stages. That for the larvae includes pupae which accompanied the specimens when collected but which were insufficiently mature to make an adult determination. Pupae containing pharate adults are treated as adult records and recorded in their section of the species accounts.

Some new morphological terms have been introduced. They appear in bold-face when first used in the text and their application explained in the following figures: female genitalia (Fig. 27); head capsule (Figs. 14-15); larva (Figs. 1-2, 30).

TAXONOMY-ADULTS

BLEPHARICERA, TENUIPES GROUP

DIAGNOSIS

COLORATION: *General.*—Integument well sclerotized, generally gray-brown or deep red-brown with dull gray (plumbeous) overtones. Membranes and appendages pale yellow to medium brown. All major sclerite surfaces opalescent; head sclerite surfaces also finely pruinose. *Head.*—Face, occiput and basal portion of clypeus gray, pruinose. **Suprafrontal carina** and distal portion of clypeus dull orange to brown. **Callis oculi** shiny black. *Antenna.*—Scape brownish yellow, pedicel and flagellum dark brown. Mouthparts generally orange to yellow, palpus grading to brown apicad. *Thorax.*—Anterior pronotum, mesoscutum and scutellum gray to gray brown; posterior pronotum, posterolateral corners of scutum usually, and prescutellar area of scutum often, contrasting pale brown or yellow. No other well-defined lines or patterns on scutum. Preepisternum, episternum and meron similar to scutum but lighter and sometimes with reddish-brown tints; remainder of pleuron light brown to yellow. *Legs.*—Brownish-yellow basad, grading to dark brown distad. *Wing.*—Hyaline in both sexes; veins brown. *Haltere.*—Stem yellow or light brown basad; knob dark brown. *Abdomen.*—Tergites and sternites similar to scutum. Pleural membranes yellow to brown. Genitalia yellow orange to dark brown.

SIZE: Generally medium to small Blephariceridae. Wing length, range 3.2 - 9.5 mm.

HEAD: *Structure.*—General structure as usually found in family. Antennal fossae approximate, mesofrons very narrow.

Female. Clypeus length/width 2.0-2.2. **Suprafrons** narrow, suprafrontal carina strongly convex. **Parietal sclerite** broad (0.7 times width of **infrafrons**), trapezoidal in shape. Ocellar lobes joined to form a sessile tubercle; lenses inserted on lobes apically. *Eyes.*—Approximate at level immediately anterior to ocelli, interocular distance equal to diameter of one ommatidium; upper division well differentiated from lower; callis oculi broad, anterior portion striate. Size of upper division about equal to lower in area, 13-16 rows of ommatidia along maximum dorsal arc of upper division; upper ommatidia 1.4-2.5 times diameter of lower. *Proboscis.*—Short, about 0.7 times head width. Mandibles present.

Male. Clypeus length/width ratio slightly greater than female, 2.4-3.6. Suprafrons broad, slightly convex mesally. Parietal sclerite broad, but narrower than in female (0.2-0.4 times width of infrafrons), rectangular in shape. Ocellar lobes distinct; lenses inserted on lobes apically. *Eyes.*—Disjunct at level immediately anterior to ocelli, interocular distance equal to diameters of 3-5 upper ommatidia; upper division well differentiated from lower; callis oculi absent except for narrow anterior portion. Size of upper division one-fourth to one-half of lower in area, 8-16 rows of ommatidia as in female. *Proboscis.*—Short, about 0.6 times head width. Mandibles absent. Palpal segments five, proportions constant, segment 1 small and fused at base to rostrum, 3 and 4 about equal and each slightly longer than 2, 5 three to four times length of 2, about equal to 2-3 combined. *Chaetotaxy.*—Similar in sexes, except parietal bristles usually absent in male. Major setal groups present as follows: clypeal, variably sparse over most of surface; parietal, few to numerous bristles; vertical, few short bristles; postvertical, numerous short bristles over dorsal arc of occipital foramen; occipital, numerous long bristles; postgenal, numerous long bristles. Ocular bristles short.

ANTENNA. *Structure.*—Moderately long, about 1.5 times head width, 15-segmented. Scape subspherical, pedicel conopiform, flagellomeres elongate-cylindriform in female, stouter and compressed in male. *Chaetotaxy.*—Scape with group of numerous long slender bristles mesoventrally. Pedicel with small dorsal and ventral groups of short bristles. Flagellomeres with dense vestiture of macrotrichia (these more numerous on male) and scattered placoid sensilla on apical segments (confined to apex of terminal segment in male).

THORAX: *Chaetotaxy.*—Setal patterns incompletely studied. Scutellar bristles dense laterally, incomplete or absent mesally. *Wing.*—Venation typical for genus.

Dorsal macrotrichia on veins R_5 and M_3 complete, M_{1+2} and M_4 apically only. *Legs.*—Segments simple, tarsal segments 5 all unmodified. Tibial spurs absent from fore and mid legs, 1 or 2 on hind leg. Claws simple, similar and not enlarged.

FEMALE GENITALIA: VIIIth sternite lobes broadly rounded, with or without setae. Oviscapt subquadrate, base slightly wider than apex, inner piece poorly developed. Spermathecae three (rarely two) in number, generally ovoid in shape with no or poorly developed necks.

MALE GENITALIA: Segments VIII and IX not specially modified; IXth tergite lobes prominent, subquadrate in form, posterior margin with a small acute projection. Basistyle short and broad, slightly longer than outer dististyle. Latter a simple, elongate lobe, slightly depressed on inner surface apically. Inner dististyle a narrow curved spatulate lobe. Phallosome vesica small, spherical; apodeme a simple, vertical flange. Parameres and penis filaments varied in form.

KEY TO SPECIES

ADULT MALES

1. Median penis filament distinctly longer than laterals and with asymmetrical, hooked apex. Wing length 4.1 mm (3.4-4.65). Apex of paramere an incurved, asymmetrically bifurcate finger. IXth tergite lobe shape as in figure 22. .... *similans*
   Median penis filament about same length as laterals, apex unmodified or only slightly enlarged. Apex of paramere and IXth tergite lobe varied in shape but not as above. Wing length 3.2-6.6 mm 2
2. Posterior margin of tegmen deeply incised on either side of midline. Apex of paramere a dorso-mesally directed hook. IXth tergite lobe as in figures 24 or 26. Wing length 5.4 mm (4.4-6.2) .... *tenuipes*
   Posterior margin of tegmen entire. Other characters varied but not as above ... 3
3. Inner margin of IXth tergite lobe greatly expanded mesad (posteromesal corner obliterated). Larger species, wing length 4.8 mm or greater 4
   Inner margin of IXth tergite lobe straight from posteromesal corner to base, not greatly expanded (posteromesal corner angulate). Smaller species, wing length 4.8 or less 5
4. Inner wall of apex of paramere an incurved, acute process extending well beyond aperture. IXth tergite lobe shape as in fig. 28. Wing length 5.6 mm (4.9-6.6) .... *williamsae*
   Inner wall of apex of paramere very slightly produced, truncate; aperture terminal. IXth tergite lobe shape as in figure 16. Wing length 5.1 mm (4.8-5.3) .... *capitata*
5. Posterior margin of IXth tergite lobe with submesal projection, general shape as in figure 18. Wing length 4.4 mm (4.0-4.8) .... *cherokea*
   Posterior margin of IXth tergite lobe straight, oblique, general shape as in figure 20. Wing length 3.8 mm (definitive range undetermined) .... *diminutiva*

ADULT FEMALES

1. Two spermathecae, median reduced to a cylindrical rod. Wing length 6.0 mm (5.4-7.3) .... *similans*
   Three spermathecae. Wing length varied 2
2. Ducts of lateral spermathecae sclerotized for a short length before genital aperture. Wing length 5.95 mm (5.2-6.4) .... *capitata*
   Ducts of spermathecae membranous throughout. Wing length varied 3
3. A large species, wing length 8.1 mm (6.75-9.5). Thoracic scutum with a contrasting light brown quadrate area anterior to scutellum. VIIIth sternite lobe of genitalia devoid of setae .... *williamsae*
   Smaller species, wing length 7.1 mm or less. Thoracic scutum generally unicolorous. VIIIth sternite lobe of genitalia usually with at least one major seta ... 4
4. VIIIth sternite lobes contiguous, median fold V-shaped. Very small species, wing length 5.1 mm (definitive range undetermined) .... *diminutiva*
   VIIIth sternite lobes disjunct, median fold U-shaped. Larger species, wing length usually greater than 6.0 mm (5.5-7.1) 5
5. Mesoscutum reddish-brown. Accessory gland a straight tube with irregular anterior sclerotizations. Wing length 6.0 mm (5.5-6.5) .... *cherokea*
   Mesoscutum dull gray (plumbeous). Accessory gland triangular, very broad posteriorly, membranous anteriorly; wing length 6.6 mm (6.0-7.1) .... *tenuipes*

BLEPHARICERA CAPITATA (LOEW)

Blepharoptera capitata Loew 1863:298-299. LECTOTYPE by present designation, female, District of Columbia, Washington, 1866, C. R. Osten Sacken, (MCZ, No. 16124).
Blepharocera capitata, Osten Sacken 1895:161. Kellogg 1903 (partim).
Blepharocera tenuipes, Aldrich 1905:172 (original synonymy; attributed to Osten Sacken). Kellogg 1907:12. Alexander 1963:56.
Blephariсera capitata, Stone 1965:99.
Blepharocera separata Alexander 1963:54-55. NEW SYNONYMY.

DESCRIPTIONS

Adult female (Figs. 9, 17)

SIZE: A medium-sized *Blephariсera*; measurements as follows: Wing length 5.95 (5.2-6.4), width 1.90 (1.60-2.10). Head width 1.06. Labrum length 0.31. Palpal segments 2-5, lengths: 0.10, 0.13, 0.145, 0.33. Leg segment lengths as below:

	fore	mid	hind
femur	3.6 (3.2-3.95)	3.6 (3.15-4.0)	4.85 (4.25-5.4)
tibia	3.1 (2.75-3.35)	3.05 (2.3-3.3)	4.45 (3.95-4.9)
tarsus 1	1.41 (1.25-1.64)	1.46 (1.30-1.60)	1.78 (1.64-1.91)
2	0.79 (0.68-0.88)	0.78 (0.66-0.85)	0.64 (0.58-0.71)
3	0.52 (0.44-0.55)	0.53 (0.48-0.56)	0.39 (0.34-0.43)
4	0.30 (0.28-0.34)	0.31 (0.25-0.39)	0.26 (0.20-0.30)
5	0.30 (0.25-0.34)	0.31 (0.25-0.36)	0.29 (0.24-0.33)

Thoracic Coloration: Anterior pronotum, mesoscutum and scutellum reddish-brown with slight gray overtone especially mesad; preepisternum, episternum and meron like mesoscutum but lighter; remainder of pleuron pale yellow.

Head (Fig. 9): Parietal sclerite with few (1-8) setae, restricted to lower half of sclerite. Distal four palpal segment proportions: 1.0, 1.4, 1.1, 2.3. Antennal segment proportions: 0.87, 0.87, **1.0**, 0.70, 0.79, 0.77, 0.75, 0.75, 0.77, 0.78, 0.76, 0.76, 0.73, 0.74, 1.31; ultimate segment 1.70 length of penultimate.

Legs: Tibial spur formula 0-0-2 (lesser very small). Progressive proportions of leg segment lengths as below:

foreleg: 1.00, 0.86, 0.46, 0.56, 0.66, 0.58, 1.01
midleg: 1.00, 0.85, 0.48, 0.53, 0.67, 0.59, 1.01
hindleg: 1.00, 0.92, 0.40, 0.36, 0.61, 0.68, 1.09

Genitalia (Fig. 17): VIIIth sternite lobes broadly rounded, median fold U-shaped, very shallow; lobe with 0-4 (usually 1) macro setae, in posterolateral region. Spermathecae 3 in number, equal in size and oval in shape; necks absent; ducts variably sclerotized, usually with posterior-most sections of two lateral ducts narrowed, smoothly sclerotized and pigmented. Accessory gland broad, anterior portion sharply expanded spherically or semi-rectangularly.

Adult male (Figs. 3, 16)

General: Character states as given for female except as follows:

Size: Smaller than female; measurements as follows: Wing length 5.1 (4.8-5.3), width 1.68 (1.60-1.80). Head width 0.86 (0.82-0.89). Labrum length 0.22 (0.20-0.24). Palpal segments 2-5, lengths: 0.10, 0.13, 0.14, 0.38. Leg segment lengths as below:

	fore	mid	hind
femur	3.1 (2.8-3.4)	3.6 (3.1-5.85)	4.35 (3.9-4.7)
tibia	2.8 (2.65-3.05)	2.8 (2.65-3.00)	4.0 (3.65-4.4)
tarsus 1	1.48 (1.38-1.63)	1.47 (1.31-1.61)	1.53 (1.31-1.75)
2	0.78 (0.69-0.88)	0.73 (0.64-0.82)	0.52 (0.44-0.61)
3	0.54 (0.60-0.48)	0.52 (0.45-0.58)	0.34 (0.25-0.38)
4	0.29 (0.26-0.31)	0.29 (0.25-0.31)	0.24 (0.20-0.29)
5	0.27 (0.25-0.31)	0.28 (0.23-0.30)	0.25 (0.21-0.26)

Head (Fig. 3): Parietal sclerite without setae. Distal four palpal segment proportions: 1.0, 1.4, 1.6, 4.2. Antennal segment proportions: 0.70, 0.71, **1.0**, 0.97, 1.02, 1.05, 0.95, 0.98, 0.96, 1.0, 0.94, 0.94, 0.88, 0.85, 1.06; ultimate segment 1.2 length of penultimate.

Legs: Tibial spur formula 0-0-1. Progressive proportions of leg segments as below:

foreleg: 1.00, 0.91, 0.52, 0.53, 0.70, 0.53, 0.94
midleg: 1.00, 0.78, 0.52, 0.50, 0.70, 0.55, 0.96
hindleg: 1.00, 0.92, 0.38, 0.34, 0.64, 0.72, 1.02

Genitalia (Fig. 16): IXth tergite lobes prominent, parallel; lobe shape irregular, outer corner a rounded right angle, posterior margin projecting beyond outer angle as a broadly rounded lobe which gradually curves into inner margin to base of lobe; bristles numerous and regular over entire dorsal surface. Paramere broad basally, gradually tapering apically and curving outwardly; apex truncate (inner margin slightly produced); aperture terminal. Penis filaments 3 in number, simple truncate rods, median slightly longer and stouter than laterals and with small apical collar or cap, all shorter than parameres.

VARIATION

Some females fail to exhibit the typical pigmented, sclerotized sections of the posterior extremes of both of the lateral spermathecal ducts. Neither duct may be so modified, but in any case this region of the duct is always narrowed and smooth walled in contrast to the wholly membranous tubules found in other species.

Males occur in which the median penis filament is scarcely stouter than the laterals, and the inner margin of the IXth tergite lobe is expanded. This character state conforms to that of the holotype of *Blephariceras separata* Alexander. Since these specimens are identical in all other ways with the presumed male of *capitata*, I choose to interpret these differences as minor and therefore synonymize Alexander's form.

REMARKS

Some authors have synonymized *capitata* with *tenuipes*, but apparently without basing their decision on a thorough examination of the types of *capitata*. I have assembled five specimens which appear to be from the original series (collected by Osten Sacken) including two females labelled "type" in the collection of MCZ. No males are among these although indicated in Loew's description. Believing Loew to be in error in citing the sex of his material, I have selected one of the latter two females as a lectotype.

Superficially these females are indistinguishable from typical *tenuipes*. However, the genitalia are distinct and define a separate species to which I assign equally distinct males found at the type locality where no other species are known to occur.

DISTRIBUTION (Fig. 37)

This species is found along the entire Appalachian chain and beyond to the north into New Brunswick. The form named *separata* by Alexander may appear anywhere in this range and apparently is no more than an occasional variant.

MATERIAL

Adults: DISTRICT OF COLUMBIA. Washington, 1866, C. R. Osten Sacken (1 ♀ LECTOTYPE: MCZ No. 16124; 4 ♀ PARALECTOTYPES: MCZ No. 16124, AMNH, USNM). GEORGIA, *Rabun County*. Pine Mountain, 1400 feet, 15 May 1957, W. R. M. Mason (21 ♂, 6 ♀: CNC). *Towns County*. Hiawassee, 16 June 1945, P. W. Fattig (1 ♂: USNM). MARYLAND, *Cecil County*. Octorora Canyon, 17 June 1939, E. G. Fisher (1 ♀:ANSP). *Prince George's County*. Beltsville, 28 May 1916, W. L. McAtee (2 ♀:USNM). NEW HAMPSHIRE, *Grafton County*. Franconia, Mrs. Slosson (1 ♂:USNM). PENNSYLVANIA, *Monroe County*. Delaware Water Gap, 15 June 1934, C. P. Alexander (1 ♂:USNM). VIRGINIA, *Fairfax County*. Great Falls, 21 June 1931, A. L. Melander (1 ♀:USNM); Trammel's Landing, Potomac River, [above Great Falls, now Riverbend County Park] 26, 28 May 1935, A. Stone (1 ♂, 2 ♀:USNM). VERMONT, *Chittenden County*. Smuggler's Notch, 18 June 1927, C. P. Alexander (♀:USNM).

Atypical (*separata* form).—MAINE, *Somerset County*. Bingham, along the Kennebec River, 17 July 1937, C. P. Alexander (3♂ PARATYPES: CPA). NEW BRUNSWICK, *Northumberland County*. Boiestown, 13 July 1931, J. M. Aldrich (1♂:USNM). NORTH CAROLINA, *Madison County*. Hot Springs (1♂:AMNH). *Swain County*. Soco Valley, Cherokee, 20 June 1954, J. W. Green (1♀:CAS). NEW YORK, *Fulton County*. Sport Island, Sacandaga River, 18 June 1914, C. P. Alexander (2♀:USNM). PENNSYLVANIA, *Lebanon County*. Ono, 7 June 1940, A. L. Melander (1♀:USNM). VERMONT, *Windham County*. Dummerston, 14 July 1908 (1♀:USNM).

BLEPHARICERA CHEROKEA NEW SPECIES

DIAGNOSIS

Adults

Blepharicera cherokea is well defined only by characters found in the male genitalia, principally the shapes of the IXth tergite lobes and apex of the paramere. The former resembles that of *tenuipes*, but the small median lobe on the hind margin is decidedly more mesal and the outer corner less pronounced. The latter presents a complex appearance in *tenuipes*, being a dorso-mesally directed, asymmetrical hook, formed by elaboration of the inner wall, while in *cherokea* both inner and outer walls terminate almost equally, giving the structure an oblique, truncate apex.

Female specimens with the anterior portion of the accessory gland irregularly sclerotized are tentatively assigned to this species. There is little else to separate them from *tenuipes*, the most closely related entity.

ETYMOLOGY

This species is named in honor of the Cherokee Indian Nation, in whose homeland it resides.

DESCRIPTIONS

Adult female (Figs. 10, 19)

SIZE: A moderately-small *Blepharicera*; measurements as follows: wing length 6.0 (5.5-6.5), width 1.96 (1.85-2.15). Head width 1.10. Labrum length 0.32. Palpal segments 2-5, lengths: 0.10, 0.14, 0.15, 0.49. Leg segment lengths as below:

	fore	mid	hind
femur	3.7 (3.35-4.1)	3.6 (3.15-4.0)	4.8 (4.35-5.1)
tibia	3.1 (2.7-3.4)	2.9 (2.55-3.05)	4.4 (3.9-4.6)
tarsus 1	1.44 (1.31-1.53)	1.48 (1.24-1.61)	1.90 (1.63-2.06)
2	0.75 (0.63-0.85)	0.72 (0.60-0.81)	0.66 (0.63-0.75)
3	0.46 (0.38-0.55)	0.45 (0.38-0.54)	0.38 (0.29-0.43)
4	0.28 (0.23-0.34)	0.27 (0.23-0.29)	0.26 (0.23-0.28)
5	0.29 (0.25-0.35)	0.29 (0.25-0.33)	0.29 (0.26-0.31)

THORACIC COLORATION: Anterior pronotum, mesoscutum and scutellum reddish-brown with gray overtone, especially mesally; lateral corners of anterior and posterior pronota yellow; preepisternum, episternum and meron like mesoscutum but lighter; remainder of pleuron pale yellow.

HEAD (Fig. 10): Parietal sclerite with numerous (20-30) setae over entire median portion. Distal four palpal segment proportions: 1.0, 1.4, 1.5, 4.9. Antennal segment proportions: 0.85, 0.85, **1.0**, 0.69, 0.77, 0.85, 0.77, 0.77, 0.75, 0.77, 0.69, 0.69, 0.62, 0.69, 1.08; ultimate segment 1.56 length of penultimate.

LEGS: Tibial spur formula 0-0-2, (lesser spur of hind leg about one-half the size of greater). Progressive proportions of leg segments as below:

foreleg: 1.00, 0.82, 0.47, 0.52, 0.61, 0.61, 1.04
midleg: 1.00, 0.82, 0.51, 0.49, 0.63, 0.60, 1.07
hindleg: 1.00, 0.92, 0.43, 0.35, 0.58, 0.68, 1.12

GENITALIA (Fig. 19): VIIIth sternite lobes wide-set, median fold shallowly U-shaped; each lobe with few to numerous setae. Spermathecae 3 in number, equal in size and ovoid in shape; necks short. Accessory gland a straight tube with irregular anterior sclerotizations.

Adult male (Figs. 4, 18)

GENERAL: Character states as given for female except as follows:

SIZE: Smaller than female; measurements as follows: Wing length 4.4 (4.0-4.8), width 1.48 (1.35-1.70). Head width 0.67. Labrum length 0.19. Palpal segments 2-5, lengths 0.10, 0.14, 0.14, 0.39. Leg segment lengths as below:

	fore	mid	hind
femur	2.8 (2.55-3.1)	2.9 (2.6-3.55)	3.75 (3.4-4.3)
tibia	2.6 (2.35-2.9)	2.5 (2.25-2.8)	3.5 (3.2-3.9)
tarsus 1	1.46 (1.33-1.63)	1.39 (1.26-1.50)	1.35 (1.23-1.48)
2	0.73 (0.64-0.81)	0.69 (0.60-0.78)	0.45 (0.40-0.50)
3	0.51 (0.44-0.58)	0.49 (0.41-0.54)	0.28 (0.25-0.31)
4	0.25 (0.23-0.28)	0.25 (0.21-0.26)	0.18 (0.16-0.23)
5	0.23 (0.20-0.25)	0.23 (0.20-0.25)	0.20 (0.18-0.25)

HEAD (Fig. 4): Parietal sclerite without setae. Distal four palpal segment proportions: 1.0, 1.4, 1.4, 4.0. Antennal segment proportions: 0.63, 0.63, **1.0**, 0.94, 1.16, 1.18, 1.10, 1.10, 1.10, 1.18, 1.18, 1.18, 1.10, 1.18, 1.26; ultimate segment 1.06 length of penultimate.

LEGS: Tibial spur formula 0-0-1. Progressive proportions of leg segments as below:

foreleg: 1.00, 0.92, 0.50, 0.50, 0.70, 0.49, 0.92
midleg: 1.00, 0.86, 0.55, 0.50, 0.70, 0.50, 0.94
hindleg: 1.00, 0.93, 0.39, 0.33, 0.62, 0.65, 1.13

GENITALIA (Fig. 18): IXth tergite lobes prominent, parallel; lobe shape subquadrate, outer posterior corner a rounded right angle, not prominent; pointed lobe projecting from hind margin displaced mesad; bristles numerous and regular over entire dorsal surface. Tegmen entire, with a slight apico-median carina. Paramere broad basally, tapering regularly and gradually to apex; apex simple, obliquely truncate (inner wall only very slightly longer than outer); aperture terminal. Penis filaments

3 in number, equal in length, shorter than parameres, all simple truncate rods, the median slightly stouter than laterals.

VARIATION

The numer of setae on the VIIIth sternite lobe of the female varies from 3 to 8. This indicates possible heterogeneity in the small sample available to me. Associated material is definitely needed to confirm the identity of the females of this species.

REMARKS

Association of the sexes is in some doubt because no females are available from the type locality. Collecting from populations containing known males should easily resolve the question.

DISTRIBUTION (Fig. 39)

This species is known only from the type locality and collections near the southern end of the Appalachians (Georgia and North Carolina).

MATERIAL

Types.—HOLOTYPE ♂ (genitalia on slide no. CLH 75-166; head on slide no. CLH 75-239: NORTH CAROLINA, *Macon County.* Highlands, Clear Creek, 3200 feet, 1-2 July 1958, J. G. Franclemont. 25 PARATYPE ♂: same data as holotype. All deposited at CU.

Additional specimens. GEORGIA, *Dawson County.* Amicalola Falls No. 5, 14 June 1960, G. W. Byers (19♀:KU). NORTH CAROLINA, *Swain County.* Bryson City, 3-5000 feet, May 1936, R. C. Shannon (1♂:USNM); Cherokee, Soco Valley, 20 June 1954, J. W. Green (1♀:CAS); Cherokee, 2000 feet, 24 May 1957, W. R. M. Mason (1♀:CNC). TENNESSEE, *Sevier County.* Greenbrier Cove, 2000 feet, Great Smoky Mountains National Park, 18 May 1957, J. R. Vockeroth (2 ♂:CNC).

BLEPHARICERA DIMINUTIVA NEW SPECIES

DIAGNOSIS

Adults

Although this is the smallest species of *Blepharicera* it is set apart from the other members of its group primarily by unique features of the male genitalia: a simple, subquadrate IXth tergite lobe rather than the complex and marginally expanded shapes of all the other species, and the paramere apex with merely a thin, truncate extension of the shaft in place of being forked or spined in various ways. The females are difficult to distinguish because the most reliable character (shape of the accessory gland) is often obscure. This structure is an indefinite, membranous tube in this species whereas in the other species it assumes a variety of forms as a result of sclerotization. Also characteristic, but ill-defined, are the close-set VIIIth tergite lobes, meeting with a V-shaped median fold between; in all the other species the median fold is much broader, U-shaped and often with angular basal corners.

ETYMOLOGY

The name is derived from the Latin adjective *diminutivus*, meaning tiny, in reference to the species' small size.

DESCRIPTIONS

Adult female (Figs. 11, 21)

SIZE: A very small *Blepharicera*; measurements as follows: Wing length 5.1, width 1.63. Head width 0.97. Labrum length 0.32. Palpal segments 2-5, lengths: 0.09, 0.12, 0.13, 0.44. Leg segment lengths as below:

	fore	mid	hind
femur	3.3	3.1	4.2
tibia	2.7	2.55	3.9
tarsus 1	1.25	1.2	1.6
2	0.595	0.545	0.52
3	0.39	0.34	0.33
4	0.215	0.215	0.21
5	0.23	0.23	0.22

THORACIC COLORATION: Anterior pronotum and mesoscutum generally brownish-gray; scutellum brownish-yellow; corner of posterior pronotum yellow; preepisternum, episternum and meron like mesoscutum but lighter; remainder of pleuron brownish-yellow.

HEAD (Fig. 11): Parietal sclerite with numerous setae over entire median portion. Distal four palpal segment proportions: 1.0, 1.3, 1.4, 4.9. Antennal segment proportions: 0.85, 0.77, **1.0**, 0.85, 0.92, 0.77, 0.77, 0.77, 0.77, 0.69, 0.69, 0.69, 0.54, 0.54, 1.0; ultimate segment 1.85 length of penultimate.

LEGS: Tibial spur formula 0-0-2 (lesser spur of hind leg minute). Progressive proportions of leg segment lengths as below:

foreleg: 1.00, 0.82, 0.47, 0.48, 0.66, 0.55, 1.07
midleg: 1.00, 0.82, 0.46, 0.46, 0.62, 0.63, 1.07
hindleg: 1.00, 0.92, 0.42, 0.32, 0.64, 0.64, 1.05

GENITALIA (Fig. 21): VIIIth sternite lobes close-set, median fold V-shaped; each lobe with a few (4-6) macro setae. Spermathecae 3 in number, equal in size and ovoid in shape; necks short to nearly absent; ducts membranous throughout. Accessory gland a simple membranous tube, without definite shape.

Adult male (Figs. 5, 20)

GENERAL: Character states as given for female except as follows:

SIZE: Smaller than female; measurements as follows: Wing length 3.8, width 1.29. Head width 0.65. Labrum length 0.17. Palpal segments 2-5, lengths: 0.09, 0.09, 0.10, 0.35. Leg segment lengths as below:

	fore	mid	hind
femur	2.3	2.4	3.2
tibia	2.1	2.05	2.95
tarsus 1	1.13	1.07	1.17
2	0.51	0.50	0.35
3	0.35	0.35	0.22
4	0.19	0.19	0.145
5	0.17	0.18	0.17

HEAD (Fig. 5): Parietal sclerite without setae. Distal four palpal segment proportions: 1.0, 1.0, 1.1, 3.9. Antennal segment proportions: 0.90, 0.70, **1.0**, 0.80, 0.90, 1.0, 0.90, 0.90, 0.80, 0.90, 0.80, 0.90, 0.80, 0.90, 1.10; ultimate segment 1.2 length of penultimate.

LEGS: Tibial spur formula 0-0-1. Progressive proportions of leg segment lengths as below:

foreleg: 1.00, 0.91, 0.54, 0.45, 0.69, 0.54, 0.89
midleg: 1.00, 0.85, 0.52, 0.46, 0.70, 0.54, 0.94
hindleg: 1.00, 0.91, 0.40, 0.30, 0.63, 0.66, 1.15

GENITALIA (Fig. 20): IXth tergite lobes prominent, slightly divergent; lobe shape subquadrate, a slight lobe projecting from midposterior margin, inner margin straight; bristles numerous and regular over entire dorsal surface. Tegmen entire. Paramere with a broad base, straight and gradually tapering shaft; apex a short, truncate, thin extension, with a slightly produced inner margin; aperture terminal. Penis filaments 3 in number, equal in length, shorter than parameres; all simple, similar, capitate rods.

REMARKS

The simplicity of several characters in both sexes (shape of the male IXth tergite lobe, V-shaped female median fold) of this species, its overall smallness and its rarity raise the possibility that it may actually constitute the negative allomorphic variant of another, sympatric form, perhaps *cherokea*. However, until this can be positively demonstrated, I think the entity should be recognized as a species.

DISTRIBUTION (Fig. 38)

This species has the most restricted range of the eastern *Blepharicera*. It is known only from localities clustered in the southernmost sector of the Blue Ridge Mountains located at the junction of the states of Georgia, South Carolina and North Carolina.

MATERIAL

Types.—HOLOTYPE ♂ (genitalia on slide no. CLH 75-177; wing on slide no. CLH 75-243): NORTH CAROLINA, *Macon County*. Highlands, Clear Creek, 3200 feet, 1 July 1958, J. G. Franclemont; ALLOTYPE ♀ (genitalia on slide no. CLH 75-155; mid and hind legs on slide no. CLH 75-248); 1 PARATYPE ♂ and 1 PARATYPE ♀: same data as holotype. All deposited at CU.

Additional specimens.—NORTH CAROLINA, *Transylvania County*. Lake Toxaway, 12 July 1957, J. G. Chillcott (1 ♂:CNC). GEORGIA, *Rabun County*. Addie Branch, east fork of Chattooga River, 2400 feet, 1 August 1957, J. G. Chillcott (1♀:CNC); Rabun Bald, 3000 feet, 14 July 1957, J. G. Chillcott (1♀:CNC); Tallulah Falls, 10 June 1910 (1♀:CU); Satalah, 2000 feet, 1 July 1957, J. R. Vockeroth (2♂:CNC).

BLEPHARICERA SIMILANS (JOHANNSEN)

Blepharocera similans Johannsen 1929: 123-124. Type locality, Massachusetts, Hampshire County, Orient Springs, near Amherst. Holotype male, CU.
Blepharocera similans, Johannsen 1934:50. Alexander 1963:55.
Blepharicera similans, Stone 1965:99.

DESCRIPTIONS

Adult female (Figs. 12, 23)

SIZE: A medium-sized *Blepharicera*; measurements as follows: Wing length 6.0 (5.4-7.3), width 2.05 (1.69-2.75). Head width 1.08. Labrum length 0.37. Palpal segments 2-5, lengths: 0.11, 0.14, 0.14, 0.45. Leg segment lengths as below:

	fore	mid	hind
femur	3.5 (2.3-4.25)	3.76 (3.25-6.65)	4.8 (4.25-5.65)
tibia	3.0 (2.75-3.55)	2.9 (2.6-3.25)	4.3 (3.7-5.05)
tarsus 1	1.44 (1.26-1.68)	1.30 (1.15-1.44)	1.70 (1.41-2.0)
2	0.71 (0.57-0.81)	0.67 (0.54-0.76)	0.60 (0.46-0.73)
3	0.41 (0.26-0.50)	0.41 (0.30-0.46)	0.36 (0.28-0.41)
4	0.30 (0.29-0.33)	0.26 (0.21-0.30)	0.26 (0.21-0.30)
5	0.34 (0.28-0.43)	0.33 (0.30-0.40)	0.34 (0.31-0.39)

THORACIC COLORATION: Anterior pronotum and mesoscutum generally dark gray-brown; scutellum distinctly lighter than mesoscutum, brown, darker laterally; preepisternum, episternum and meron reddish brown; remainder of pleuron light-brown.

HEAD (Fig. 12): Parietal sclerite with numerous setae (15-20) on lateral half of surface. Distal four palpal segment proportions: 1.0, 1.25, 1.2, 4.0. Antennal segment proportions: 0.60, 0.80, **1.0**, 0.78, 0.71, 0.75, 0.66, 0.63, 0.63, 0.60, 0.59, 0.59, 0.59, 0.54, 0.93; ultimate segment 1.72 length of penultimate.

LEGS: Tibial spur formula 0-0-1. Progressive proportions of leg segment lengths as below:

foreleg: 1.00, 0.86, 0.47, 0.49, 0.58, 0.75, 1.12
midleg: 1.00, 0.77, 0.44, 0.51, 0.61, 0.63, 1.28
hindleg: 1.00, 0.89, 0.40, 0.35, 0.60, 0.72, 1.32

GENITALIA (Fig. 23): VIIIth sternite lobes broadly rounded, median fold deep, U-shaped, basal corners angular; lobe without setae. Spermathecae 2 in number, the median one reduced to a vestigial, sclerotized bar; laterals ovoid, equal in size and in shape; necks very short; ducts membranous throughout. Accessory gland cylindrical with a slightly inflated median zone.

Adult male (Figs. 6, 22)

GENERAL: Character states as given for female except as follows:

SIZE: Smaller than female; measurements as follows: Wing length 4.1 (3.4-4.65), width 1.32 (1.20-1.50). Head width 0.73 (0.69-0.82). Labrum length 0.21 (0.18-0.24). Palpal segments 2-5, lengths 0.08, 0.12, 0.12, 0.42. Leg segment lengths as below:

	fore	mid	hind
femur	2.6 (2.2-3.05)	2.7 (2.2-3.2)	3.55 (2.9-4.25)
tibia	2.4 (1.9-2.9)	2.3 (2.0-2.7)	3.3 (2.7-3.85)
tarsus 1	1.31 (0.85-1.56)	1.26 (0.98-1.48)	1.23 (0.98-1.45)
2	0.62 (0.44-0.75)	0.60 (0.49-0.74)	0.39 (0.33-0.48)

	fore	mid	hind
3	0.42 (0.28-0.61)	0.41 (0.33-0.48)	0.23 (0.16-0.30)
4	0.22 (0.13-0.28)	0.22 (0.16-0.28)	0.16 (0.13-0.19)
5	0.22 (0.16-0.28)	0.22 (0.16-0.28)	0.20 (0.13-0.24)

HEAD (Fig. 6): Parietal sclerite without setae. Distal four palpal segment proportions: 1.0, 1.3, 1.4, 4.1. Antennal segment proportions: 0.77, 0.68, **1.0**, 0.79, 0.82, 0.86, 0.79, 0.76, 0.72, 0.74, 0.75, 0.81, 0.80, 0.83, 1.11; ultimate segment 1.3 length of penultimate.

LEGS: Tibial spur formula 0-0-1. Progressive proportions of leg segments as below:

foreleg: 1.00, 0.93, 0.55, 0.47, 0.68, 0.51, 1.02
midleg: 1.00, 0.86, 0.54, 0.47, 0.68, 0.54, 1.00
hindleg: 1.00, 0.94, 0.37, 0.32, 0.59, 0.70, 1.25

GENITALIA (Fig. 22): IXth tergite lobes prominent, parallel; lobe shape irregular, outer corner a rounded right angle, posterior margin projecting posteriorly as an acute prominence, inner margin evenly and shallowly curved to the slightly constricted base; bristles numerous and regular over entire dorsal surface. Tegmen entire. Paramere broad basally, tapering gradually to two-thirds, then abruptly narrowing ectally to point where ental wall terminates, apex extended beyond aperture as a gradually incurved, asymmetrically bifurcate finger. Penis filaments 3 in number, all shorter than paramere but median heavier and longer than laterals and with a hooked apex.

VARIATION

No notable variations were observed in this species, which is the most constant and distinctive member of the Tenuipes Group.

REMARKS

The female of this species is unique in the genus in the absence of the median spermatheca. The organ is replaced by an elongate structure apparently modified especially to receive the male's extra long, hooked, median penis filament. The functional significance of this adaptation is unknown.

DISTRIBUTION (Fig. 40)

There are collections of *similans* from localities along the entire Appalachian chain from Maine to South Carolina and Tennessee. The species is sympatric with all the other members of its group, but would appear to be the least likely one to hybridize because of the genitalic peculiarities mentioned above. This also, perhaps, explains its lack of variability.

MATERIAL

Adults.—*CANADA*. NOVA SCOTIA, *Colchester County*. Truro, 4 July 1913, R. Matheson (3 ♂:CU). QUEBEC, *Gatineau County*. Wakefield, 9 July 1946, G. E. Shewell (2 ♂:CNC); 18 September 1928, 25 July 1926, F. P. Ide (1 ♂, 1 ♀:ROM); 21 July 1926, G. S. Walley (1 ♂, 1 ♀:CNC); 1 July 1959, J. R. Vockeroth (1 ♂, 1 ♀:CNC). *Huntingdon County*. Covey Hill, 8 July 1924, G. S. Walley (1 ♂:CNC). *Laprarie County*. Laprarie, 8 July 1924, G. S. Walley (1 ♂:CNC). *UNITED STATES*. GEORGIA, *Dawson County*. Amicalola Falls No. 5, 14 June 1960, G. W. Byers (1 ♀:KU). *Rabun County*. Satalah, 2000 feet, 1 July 1957, J. R. Vockeroth (5 ♂:CNC). Warwoman Creek, 1500 feet, 31 July 1957, J. G. Chillcott (2 ♂, 1♀:CNC). MASSACHUSETTS, *Hampshire County*. Amherst, 25 June 1927 (1 ♂:BMNH), Orient Springs, 375 feet, 30 May 1926, C. P. Alexander (1 ♀:CPA). NEW HAMPSHIRE, *Coos County*. Gorham, 18 July 1929, G. S. Walley (5 ♂:CNC). Moose Creek, Gorham, 19 July 1929, J. McDunnough (1 ♀:CNC). Dolly Copp, White Mountains, 29 August 1937, A. L. Melander (1 ♂, 5 ♀:USNM). *County Unknown*. White Mountains, Morrison (2♂:USNM). NEW YORK, *Essex County*. Wilmington, Adirondacks, 31 July 1929, A. L. Melander (4 ♂, 6 ♀:USNM). High Falls, Ausable River, 5 July 1938. C. P. Alexander (2 ♂:USNM). Lake Placid, 28 July 1929, A. L. Melander (5 ♂:USNM); 1 July 1922, J. M. Aldrich (3 ♂:USNM); 19 July 1962, J. R. Vockeroth (3 ♀:CNC). NORTH CAROLINA, *Avery County*. Linville, 3200 feet, 21 June 1939, C. P. Alexander (3 ♀:CPA). *Macon County*. Clear Creek, Highlands, 3200 feet, 1-2 July 1958, J. G. Franclemont (18 ♂:CU). Wayah Bald, 3500 feet, 6 July 1957, J. R. Vockeroth (1 ♀:CNC). Wayah Gap, 3500 feet, 10 August 1957, J. G. Chillcott (2 ♀:CNC). *Swain County*. Smokemount, 2 July 1941, A. L. Melander (1 ♂:USNM). Bryson City, 3-5000 feet, May 1936, R. C. Shannon (1 ♂:USNM). *Wilkes County*. Stone Mountain State Park, 10 July 1973, G. K. Pratt (2 ♂, 2 ♀:HDP). TENNESSEE, *Sevier County*. Chimneys, Great Smoky Mountains National Park, 8 July 1941, A. L. Melander (1 ♂:USNM). Smoky Mountains, 23 October 1938, I. Williams (1 ♀:CPA). VIRGINIA, *Page County*. Luray, 24 June 1933, A. L. Melander (2 ♂:USNM).

Pupae (pharate adults dissected).—*UNITED STATES*. NEW YORK, *Jefferson County*. Watertown, 30 November 1881, J. Q. Adams, No. 2213 (8 ♀, 3 pupae, 20 larvae:USNM). *Ulster County*. Vernooy Kill, 3/4 mi NW Wawarsing, 28 July 1974, P. & B. Wygodzinsky (26 pupae, 8 larvae:AMNH). NORTH CAROLINA, *Swain County*. Noland Creek, Great Smoky Mountains National Park, 16 August 1973, 24 May 1974, R. L. Green (1 pupa :LACM). TENNESSEE, *Sevier County*. Greenbrier Cove, Smoky Mountains National Park, 22 May, 10 September (?) 1938, A. C. Cole (34 pupae:UT). VIRGINIA, *Giles County*. Stoney Creek, 1800, 2000 feet, 26 May 1962, J. R. Vockeroth (18 pupae, 48 larvae:CNC). *County Unknown*. Dark Hollow Falls, Shenandoah National Park, 30 July 1949, E. A. Chapin (15 pupae:USNM).

BLEPHARICERA TENUIPES (WALKER)

Asindulum tenuipes Walker 1848:86. Type locality, CANADA, Ontario, Albany River, holotype female, BMNH.

Blepharocera capitata, Kellogg 1900:1903 (partim). Johannsen 1903:333-336.

Blepharocera tenuipes, Comstock & Comstock 1895:432-436. Aldrich 1905:172. Kellogg 1907:12. Johannsen 1934:54. Alexander 1963:56.

Blepharicera tenuipes, Stone 1965:99.

DESCRIPTIONS

Adult female (Figs. 14-15, 27)

SIZE: A medium-sized *Blepharicera*; measurements as follows: Wing length 6.6 (6.0-7.1), width 2.1 (1.78-2.4). Head width 1.08 (1.01-1.44). Labrum length 0.38. Palpal segments 2-5, lengths: 0.11, 0.15, 0.17, 0.46. Leg segment lengths as below:

	fore	mid	hind
femur	3.9 (3.4-4.3)	3.8 (3.35-4.2)	5.4 (4.9-5.8)
tibia	3.3 (3.0-3.6)	3.2 (2.9-3.45)	4.9 (4.3-5.3)
tarsus 1	1.57 (1.30-1.79)	1.31 (0.89-1.65)	2.10 (1.84-2.21)
2	0.82 (0.68-0.94)	0.77 (0.56-0.94)	0.75 (0.68-0.84)
3	0.52 (0.45-0.60)	0.49 (0.41-0.59)	0.44 (0.40-0.49)
4	0.32 (0.24-0.37)	0.33 (0.27-0.40)	0.33 (0.28-0.37)
5	0.39 (0.33-0.46)	0.40 (0.33-0.46)	0.36 (0.28-0.43)

THORACIC COLORATION: Anterior pronotum and mesoscutum generally dull gray (plumbeous), corner of posterior pronotum and scutellum contrasting light brown, latter darker laterad; preepisternum, episternum and meron similar to scutum but paler and with reddish-brown cast; remainder of pleuron brownish-yellow.

HEAD (Figs. 14-15): Parietal sclerite with numerous setae (22-32) over entire median surface. Distal four palpal segment proportions: 1.0, 1.4, 1.1, 2.7. Antennal segment proportions: 0.92, 1.00, **1.0**, 0.85, 0.85, 0.85, 0.77, 0.77, 0.81, 0.85, 0.77, 0.77, 0.69, 0.62, 0.92; ultimate segment 1.50 length of penultimate.

LEGS: Tibial spur formula 0-0-2 (spurs subequal). Progressive proportions of leg segment lengths as below:

foreleg: 1.00, 0.84, 0.47, 0.52, 0.63, 0.62, 1.22
midleg: 1.00, 0.85, 0.40, 0.59, 0.64, 0.67, 1.21
hindleg: 1.00, 0.90, 0.43, 0.36, 0.59, 0.75, 1.09

GENITALIA (Fig. 27): VIIIth sternite lobes broadly rounded, median fold shallow and wide at base; lobe with a few (usually 6-7) macro setae. Spermathecae 3 in number, equal in size and ovoid in shape; necks very short; ducts membranous throughout. Accessory gland triangular, very broad posteriorly, tapering strongly anteriorly.

Adult male (Figs. 7, 24-26)

GENERAL: Character states as given for female except as follows:

SIZE: Smaller than female; measurements as follows: Wing length 5.4 (4.4-6.2), width 1.83 (1.56-2.16). Head width 0.86 (0.81-0.94). Labrum length 0.25 (0.22-0.29). Palpal segments 2-5, lengths 0.12, 0.15, 0.16, 0.44. Leg segment lengths as below:

	fore	mid	hind
femur	3.3 (2.9-3.7)	3.5 (3.0-3.9)	4.7 (4.1-5.0)
tibia	3.1 (2.7-3.4)	2.95 (2.6-3.3)	4.3 (3.8-4.6)
tarsus 1	1.60 (1.24-1.85)	1.53 (1.28-1.76)	1.68 (1.38-1.87)
2	0.82 (0.71-0.92)	0.77 (0.67-0.89)	0.56 (0.46-0.68)
3	0.55 (0.39-0.70)	0.53 (0.41-0.63)	0.38 (0.33-0.57)
4	0.31 (0.27-0.35)	0.31 (0.26-0.35)	0.25 (0.21-0.35)
5	0.31 (0.24-0.41)	0.29 (0.26-0.33)	0.27 (0.23-0.33)

HEAD (Fig. 7): Parietal sclerite without setae. Distal four palpal segment proportions: 1.0, 1.25, 1.1, 2.75. Antennal segment proportions: 0.63, 0.63, **1.0**, 0.69, 0.81, 0.81, 0.78, 0.81, 0.81, 0.81, 0.78, 0.80, 0.78, 0.76, 0.91; ultimate segment 1.2 length of penultimate.

LEGS: Tibial spur formula 0-0-1. Progressive proportions of leg segments as below:

foreleg: 1.00, 0.92, 0.52, 0.51, 0.67, 0.56, 1.00
midleg: 1.00, 0.85, 0.52, 0.50, 0.69, 0.58, 0.94
hindleg: 1.00, 0.92, 0.39, 0.33, 0.68, 0.66, 1.08

GENITALIA (Figs. 24-26): IXth tergite lobes prominent, parallel; lobe shape irregular, generally quadrate, outer corner pronounced, rounded, posterior margin horizontal, with a mesally directed lobe near the middle; inner corner right angulate, the margin continuing straight to base; bristles numerous and regular over entire dorsal surface. Tegmen deeply emarginate on either side of strong, median, vertical carina. Paramere broad basally, only slightly tapering apically and nearly straight; both inner and outer walls complete to apex; apex complex, a dorso-mesally directed, asymmetrical hook; aperture subterminal. Penis filaments 3 in number, simple truncate rods, of equal diameter, all shorter than paramere.

VARIATION

The southernmost record for typical *tenuipes* is Stoney Creek, Giles County, Virginia. All specimens from localities further south exhibit certain states approaching those found in *cherokea*. The most common involves the shape of the IXth tergite lobe of the male genitalia in which the small mesal projection of the posterior margin is displaced strongly mesad (Fig. 24) as in *cherokea* (Fig. 18). In other specimens, the posterolateral corner of this same structure is abnormally pronounced, a condition also reminiscent of *cherokea* or *williamsae* (Figs. 18, 28). The tegmen in some of these same specimens has very shallow excisions on either side of the postero-median carina. In all the other species the posterior margin of the tegmen is entire and without a carina except in *cherokea*. All variants preserve the typical *tenuipes* form of the apex of the paramere although there are a few *cherokea* specimens in which the normally simple apex is slightly extended and contorted in a fashion similar to the complexities found here in *tenuipes*. The existence of these intermediates suggests close genetic ties between *cherokea* and *tenuipes*. Although the possibility of hybridization exists present material is inadequate to reveal the real nature of these relationships.

Variations in the female genitalia are less well defined and so far involve only three specimens in which the number of macro setae on the VIIIth sternite lobes and configuration of the median fold are unusual.

REMARKS

This is the most common species of *Blepharicera* in Eastern North America. Since it is the oldest named regional form, the other similar species, especially *capitata*, have been confused with it. These two are indistinguishable externally, and the genitalic characters cited in the key must be used to separate them.

DISTRIBUTION (Fig. 41)

A map plot of the records below shows *tenuipes* to be the most widespread species in the group. It is mainly northern, although atypical specimens, tentatively assigned to this taxon, appear through the southernmost portions of the range of the genus in Tennessee, North Carolina and Georgia (see VARIATION above).

There are no records over a large area north of the Great Lakes, but widely disjunct collections, to the west at the Albany River, Ontario and eastern Minnesota, and abundant suitable habitats are cause to believe that the Great Lakes region is also populated with *tenuipes*. It is the only species found in the vicinity of Ithaca, New York where it has long been well known to entomologists and students at Cornell University.

MATERIAL

Adults.—CANADA. NOVA SCOTIA, *Kings County*. Kentville, 13 July 1924, R. P. Gorham (1 ♀:CNC). *Victoria County*. Baddeck, 27 June, 1 July 1936, J. McDunnough (3

♀:CNC). ONTARIO, *Carleton County*. Ottawa, 19 July 1924, G. S. Walley (1 ♀:CNC); 22-23 June 1943, G. S. Walley (4 ♀:CNC); 24 June 1943, A. Brooks (9 ♀:CNC); 15 June 1951, J. F. McAlpine (1 ♂, 5 ♀:CNC); 13 July 1956, J. R. Vockeroth (13 ♀:CNC). Shirley Bay, Ottawa, 23 June 1961, J. A. Downes (4 ♂, 4 ♀:CNC); Brittania, Ottawa, 15 June 1938, G. E. Shewell (1 ♂:CNC). Remic Rapids, Ottawa River, 18-21 June 1949, G. E. Shewell (2 ♂:CNC). *Wentworth County*. Dundas, 29 May 1960, Taylor and Wood (1 ♂, 1 ♀:MMU). QUEBEC, *Brome County*. Glensutton, 17 June 1936, G. S. Walley (1 ♀:CNC). Knowlton, 8 July 1929, L. J. Milne (1 ♀:CNC); 13 June 1930, G. S. Walley (1 ♂:CNC). *Gatineau County*. Aylmer, 10 June 1924, 26 June 1938, C. H. Curran (33 ♀:AMNH). Chelsea, 20-25 June 1916 (2 ♀:CU). Hull, 26 June 1920, 8 July 1923, Miss. Cramp, C. H. Curran (1 ♂, 1 ♀:CNC). Old Chelsea, 22 July 1956, J. R. Vockeroth (3 ♀:CNC). Royal Ottawa Golf Club, Ottawa, 14, 31 July 1924, 27 June 1932, F. P. Ide, G. S. Walley (5 ♀:CNC, ROM). Wakefield, 21 August 1925, 21, 26 July 1926, G. S. Walley (1 ♂, 3 ♀:CNC); 14 June 1926, 28 July 1926, 4 June 1935, 18 September 1928, 9 July 1946, F. P. Ide (12 ♂, 5 ♀:CNC, ROM); 1 July 1959, J. R. Vockeroth (1 ♂:CNC). *Huntingdon County*. Covey Hill, 11, 28 June, 4 July 1924, 15, 18 June 1927, G. S. Walley (2 ♂, 2 ♀:CNC). *Kamouraska County*. Parke Reserve, 9 July 1957, G. E. Shewell (1 ♂:CNC); 8 August 1957, W. R. M. Mason (2 ♀:CNC). *Laprarie County*. Laprarie, 8 July 1924, G. S. Walley (8 ♀:CNC). *Rouville County*. Richelieu, 5 July 1927, G. S. Walley (1 ♀:CNC). *Stanstead County*. Mount Orford, 14 July 1936, G. E. Shewell (1 ♀:CNC). *UNITED STATES*. CONNECTICUT, *Fairfield County*. Redding, 11 June 1929, A. L. Melander (1 ♀:USNM). MAINE, *Hancock County*. Bar Harbor, 4 June 1913, C. W. Johnson (1 ♀:USNM). MINNESOTA, *Cook County*. Minnesota "F. S.", Hovland, 23 June 1968, E. F. Cook, N.J. mosquito trap (1 ♂:USNM). NEW JERSEY, *Morris County*. Brookside, July, A. J. Weidt (3 ♀:AMNH, USNM). NEW HAMPSHIRE, *Coos County*. Bretton Woods, 1 July 1936, A. L. Melander (2 ♂:USNM); Gorham, 18, 20 July 1929, J. McDunnough (2 ♀:CNC); Jefferson (black light trap), 10 July 1964 (1 ♀:UNH). *Grafton County*. Benton, 6 July 1931, A. L. Melander (5 ♀:USNM); Franconia, A. T. Slosson (7 ♂, 2 ♀:USNM, AMNH); Noxon Camp, 2000 feet, North Haverhill, 7 July 1931, J. M. Aldrich (3 ♀:USNM). *County unknown*. White Mountains, July (1 ♂:USNM). NEW YORK, *Erie County*. Colden, 9 July 1922, 23 July 1916, M. C. Van Duzee (2 ♀:CAS). *Essex County*. Lake Placid, 1 July 1922 (5 ♂:USNM); 28 July1929, A. L. Melander (1 ♂:USNM). Wilmington Notch, Adirondacks, 2 July, J. M. Aldrich (2 ♀:USNM). *Fulton County*. Sacandaga, 15 June 1928, C.P. Alexander (2 ♂, 1 ♀:USNM). *Lewis County*. Gomer Hill, 21 June 1963, W. W. Wirth (21 ♂, 3 ♀:USNM). Singing Waters Picnic Area, 21 June 1963, W. W. Wirth (3 ♂, 1 ♀:USNM). *Jefferson County*. Watertown, J. Q. Adams (1 ♀:USNM). *Saint Lawrence County*. Raquette River, Colton, 24 June 1963, W. W. Wirth, (1 ♂:USNM). *Tompkins County*. Coy Glen, 18 June 1894, 18 June 1895, 12 June 1920, J. M. Aldrich (part) (4 ♂, 4 ♀:LACM, USNM, CU). Fall Creek, Ithaca, 10-11 June 1920 (8 ♀:CU). Ithaca: 23 June 1885, O. E. Pearce (1 ♀:CU); 24 June 1901, J. M. Aldrich (21 ♀:USNM, AMNH); 21 June-7 July 1901 (2 ♂, 8 ♀:BMNH). 12, 27-28 June 1901 (20 ♀:UCR, CU); 14 June 1907 (1 ♀:CU); July 1908 (4 ♀:ANSP); 31 May 1914 (13 ♂, 3 ♀:USNM); 14 June 1914, 12-13, 17, 24 June 1915 (6 ♀:CU); 1, 10, 17, 21, 25 June 1916 (3 ♂, 17 ♀:KU, USNM, PSU, KS, CU); 13 June 1917, O. A. Johannsen (8 ♀:PSU, CU); 14 June 1920 (1 ♀:CU); 10 June 1925 (1 ♀:CU); 3 June 1967, R. Silberglied (1 ♀:CU); 1-7 July, N. Banks (1 ♀:OS); (3 ♀:USNM); May (6 ♂:USNM); no dates: (1 ♂, 2♀: USNM, CU); (1 ♀:CU); Forest Home, Ithaca, 30 May 1940, A. Stone (3 ♂:USNM). Taghanic, Ithaca, 26 June 1920, M. D. Leonard (3 ♀:CU). PENNSYLVANIA, *Adams County*. Arendtsville, 27 May, 10 June 1920, S. W. Frost (3 ♀:CU). *County unknown*. Castle Rock, 19 June 1910 (1 ♀:USNM). VIRGINIA, *Fairfax County*. Great Falls, 19 June 1910, 24 May 1914, 23 May 1918, 21 June 1931, 30 May 1939, F. K. Knab, W. L. McAtee, A. L. Melander, C. T. Greene (7 ♂, 14 ♀:USNM). *Giles County*. No. 5, Mountain Lake Biological Station, 1800 feet, 18 June 1965, G. W. Byers (2 ♀:KU). Stoney Creek, 2000 feet, 26 May 1962, J. G. Chillcott (9 ♂, 5 ♀:CNC). VERMONT, *Addison County*. East Middlebury, 14 June 1929, Bishopp No. 8435 (1 ♂:USNM). *Bennington County*. Peru, 15 July 1931, A. L. Melander (1 ♀:USNM). *Windham County*. Halifax Gorge, 8 June 1973, H. D. Pratt (11 ♂:HDP, CPA). LOCALITY UNKNOWN. (1 ♀:INHS).

Atypical adults.—GEORGIA, *Walker County.* Cloudland Canyon State Park, 8 May 1952, G. S. Walley et al. (20 ♂, 7 ♀:CNC). NORTH CAROLINA, *Macon County.* Highlands, 3-5000 feet, May 1936, R. C. Shannon (3 ♂:USNM). Same locality, 3200 feet, 2 July 1958, J. G. Franclemont (2 ♀:CU). *Swain County.* Deep Creek at Deep Creek Campground, Great Smoky Mountains National Park, Bryson City, 21 May 1970, Wiggins and Yamamoto, 700365 (2 ♂:ROM). TENNESSEE, *Sevier County.* Great Smoky Mountains National Park, 18 May 1957, J. R. Vockeroth (1 ♂:CNC); Greenbrier Cove, 2000 feet, 22 May 1938, I. Williams (1 ♂:USNM). VIRGINIA, *Bath County.* Blowing Springs Camp, 8 mi W Warm Springs, 18-20 May 1963, Field and Flint (2 ♂, 1 ♀:USNM). *Page County.* Luray, 21-24 June 1933, R. L. Melander (2 ♂, 3 ♀:USNM).

Pupae (pharate adults dissected).—*CANADA.* ONTARIO, *Wentworth County.* Spencer Creek, 27 May 1960, D. M. Wood (1 ♂, 6 ♀, 25 pupae, 4 larvae:CNC). QUEBEC, *Brome County.* Sutton Mountain Creek, 11 July 1929, G. S. Walley (16 pupae:CNC). *UNITED STATES.* MAINE, *Somerset County.* Pleasant Pond Stream, Caratunk, 24 June 1966, R. & D. Koss (21 pupae:JH). MASSACHUSETTS, *Worcester County.* Fitchburg, 27 May 1871 (44 pupae:USNM). NEW YORK, *Lewis County.* Gomer Hill, 21 June 1963, W. W. Wirth (19 ♂, 44 pupae, 15 larvae:USNM).

Pupae (atypical pharate adults dissected).—*UNITED STATES.* MARYLAND, *Frederick County.* Little Catoctin Creek, 1 mi N Harmony, 30 May 1958, P. H. Freytag (2 pupae, 1 larva:OSU). Little Hunting Creek, 4, 17, 25 May 1958, P. H. Freytag (5 pupae, 24 larvae:OSU). Stream 1/2 mi E Yellow Springs, 31 May 1958, P. H. Freytag (8 pupae:OSU). NORTH CAROLINA, *Swain County.* Deep Creek Campground, Great Smoky Mountains National Park, Bryson City, 21 May 1970, Wiggins & Yamamoto #700365 (4 pupae, 2 larvae:ROM). Noland Creek, Great Smoky Mountains National Park, 24 May 1974, R. L. Green (1 pupa:LACM). VIRGINIA, *Giles County.* Stoney Creek, 1800, 2000 feet, 25 May 1962, J. R. Vockeroth (33 pupae, 1 larva:CNC). *Madison County.* White Oak Creek, Shenandoah National Park, 24 June 1959, B. D. Burks (5 pupae, 4 larvae:USNM).

Blepharicera williamsae Alexander

Blepharocera williamsae Alexander 1953:43, Type locality Tennessee, Sevier County, above Greenbrier Cove, Mount Leconte, Great Smoky Mountains, 4200 feet elevation. Holotype female and allotype male in Alexander collection.

Blepharocera williamsae, Alexander 1963:57. Redescription.

Blepharicera williamsae, Stone 1965:99.

DESCRIPTIONS

Adult female (Figs. 13, 29)

Size: A medium-sized *Blepharicera*: measurements as follows: Wing length 8.1 (6.75-9.5), width 2.57 (2.1-2.9). Head width 1.27. Labrum length 0.48. Palpal segments 2-5, lengths: 0.16, 0.19, 0.18, 0.58. Leg segment lengths as below:

	fore	mid	hind
femur	4.2 (4.1-5.4)	4.45 (3.85-5.1)	6.2 (5.4-7.1)
tibia	3.5 (3.3-4.55)	3.6 (3.1-4.15)	5.5 (4.85-6.1)
tarsus 1	1.84 (1.56-2.09)	1.61 (1.36-1.80)	2.25 (1.96-2.46)
2	0.89 (0.81-1.08)	0.81 (0.65-0.99)	0.77 (0.66-0.88)
3	0.55 (0.41-0.64)	0.50 (0.38-0.59)	0.47 (0.40-0.54)
4	0.36 (0.30-0.44)	0.34 (0.30-0.41)	0.33 (0.28-0.39)
5	0.46 (0.40-0.60)	0.43 (0.35-0.58)	0.40 (0.34-0.50)

THORACIC COLORATION: Anterior pronotum and mesoscutum generally reddish-brown with slight gray overtone especially mesad; corner of posterior pronotum, posteromesal quadrate area of scutum and scutellum markedly lighter than mesoscutum, pale yellowish-brown; outer corners of scutellum darker; remainder of pleuron brownish-yellow.

HEAD (Fig. 13): Parietal sclerite with numerous (35-50) setae over entire median surface of sclerite. Distal four palpal segment proportions: 1.0, 1.2, 1.1, 3.6. Antennal segment proportions: 0.77, 0.78, **1.0**, 0.77, 0.80, 0.80, 0.80, 0.80, 0.80, 0.80, 0.74, 0.74, 0.68, 0.62, 0.99; ultimate segment 1.60 length of penultimate.

LEGS: Tibial spur formula 0-0-2 (spurs subequal). Progressive proportions of leg segment lengths as below:

foreleg: 1.00, 0.82, 0.53, 0.48, 0.62, 0.66, 1.26
midleg: 1.00, 0.81, 0.45, 0.50, 0.62, 0.67, 1.27
hindleg: 1.00, 0.89, 0.33, 0.34, 0.61, 0.63, 1.18

GENITALIA (Fig. 29): VIIIth sternite lobes disjunct, broadly rounded, median fold U-shaped, the basal corners angular; lobe without macro setae, a pair of micro setae on either side of midline on bridge between lobes. Spermathecae 3 in number, equal in size and ovoid in shape; necks very short; ducts membranous throughout. Accessory gland a slightly inflated, elongate tube.

Adult male (Figs. 8, 28)

GENERAL: Character states as given for female except as follows:

SIZE: Smaller than female; measurements as follows: Wing length 5.6 (4.9-6.6), width 1.85 (1.65-2.05). Head width 0.85. Labrum length 0.25. Palpal segments 2-5, lengths: 0.10, 0.14, 0.14, 0.52. Leg segment lengths as below:

	fore	mid	hind
femur	3.4 (2.75-4.0)	3.7 (3.45-4.2)	4.8 (4.5-5.5)
tibia	3.3 (3.1-3.7)	3.1 (2.85-3.55)	4.5 (4.1-5.3)
tarsus 1	1.78 (1.60-2.09)	1.61 (1.45-1.89)	1.70 (1.48-2.00)
2	0.83 (0.68-0.96)	0.78 (0.67-0.90)	0.56 (0.49-0.63)
3	0.58 (0.52-0.65)	0.55 (0.47-0.63)	0.37 (0.31-0.57)
4	0.31 (0.29-0.35)	0.30 (0.28-0.34)	0.25 (0.21-0.31)
5	0.30 (0.25-0.34)	0.29 (0.26-0.31)	0.27 (0.25-0.30)

HEAD (Fig. 8): Parietal sclerite with 6-7 setae in dorsolateral portion of sclerite. Distal four palpal segment proportions: 1.0, 1.4, 1.4, 5.6. Antennal segment proportions: 0.70, 0.72, **1.0**, 0.76, 0.97, 1.01, 0.94, 0.96, 0.96, 0.99, 0.96, 0.98, 0.96, 0.88, 1.11; ultimate segment 1.3 length of penultimate.

LEGS: Tibial spur formula 0-0-1. Progressive proportions of leg segment lengths as below:

foreleg: 1.00, 0.96, 0.54, 0.42, 0.70, 0.55, 0.95
midleg: 1.00, 0.81, 0.52, 0.49, 0.70, 0.55, 0.94
hindleg: 1.00, 0.93, 0.38, 0.33, 0.66, 0.68, 1.06

GENITALIA (Fig. 28): IXth tergite lobes very prominent, slightly convergent; lobe shape irregular, outer corner acutely rounded, posterior margin oblique, projecting posteriorly as an angulate lobe, inner margin strongly inflated mesally, i.e. strongly curved to a narrowed base; bristles numerous and regular over entire dorsal surface. Tegmen entire. Paramere broad basally, tapering to distal four-fifths where abruptly narrowed (outer wall terminating); apex acute and incurved; aperture subapical, at termination of outer wall. Penis filaments 3 in number, equal in length, shorter than parameres, all simple, truncate rods, median much heavier basally than laterals.

REMARKS

This is the largest species of the Tenuipes Group, although of average size for the genus. In addition to diagnostic characteristics found in the genitalia of both sexes (see keys), the adults appear distinctive, even to the naked eye, because of the light brown prescutellar quadrate area of the scutum. The scuta of all the other species are more or less unicolorous.

DISTRIBUTION (Fig. 42)

B. williamsae is known only from the extreme southern portion of the Appalachians at the confluence of Georgia, Tennessee and the Carolinas.

MATERIAL

Adults.—GEORGIA, *Lumpkin County*. De Soto Falls State Park, upper falls, 28 April 1973, H. D. Pratt (5 ♂:HDP). NORTH CAROLINA, *Macon County*. Highlands, 3-5000 feet, April-May 1936, R. C. Shannon (18 ♂, 17 ♀, 4 pupae:USNM). Clear Creek, Highlands, 3200 feet, 1-2 July 1958, J. G. Franclemont (19 ♀:CU). *County unknown*. Bubbling Spring Creek, 5100 feet, 17 July 1957, J. G. Chillcott (1 ♀:CNC). TENNESSEE, *Sevier County*. Great Smoky Mountains National Park, Greenbrier Cove, 2000 feet, 18 May 1957, W. R. M. Mason (2 ♀:CNC); same locality, 2-2500 feet, 22 April 1939, 15 May 1938, I. W. Williams (♂ ALLOTYPE, 2 ♂, 3 ♀ PARATYPES:USNM); upper Greenbrier Cove, slopes Mount Leconte, 4200 feet, 5 June 1939, C. P. Alexander (♀ HOLOTYPE:CPA).

Pupae (pharate adults dissected).—*UNITED STATES*. TENNESSEE, *Sevier County*. Greenbrier Cove, Great Smoky Mountains National Park, 22 May 1938, A. C. Cole (14 pupae:UT). Oconaluftee River near Alum Cave Bluffs, Great Smoky Mountains National Park, 8 July 1974, D. & M. Davis (10 pupae:USNM).

TAXONOMY-PUPAE

The difficulties of distinguishing pupae because of their similarity among all the species (excepting species F) was mentioned earlier. Size may be used when there is reason to believe the sample contains disparate forms. Otherwise, since length-width ratios are constant and length is a continuum from the smallest males to the largest females, one must dissect the pharate adults to identify pupae. (Size data on samples of known species are given in Table I).

DESCRIPTION

GENERAL.—Typical in basic structure for genus *Blepharicera*. Outline shape ovate, cross section hemi-oval. *Size.*—♂ 3.6-4.7; ♀ 4.7-5.7 mm. *Color* (in life). —Upper surface evenly black; lower surface white. *Structure.*—Dorsal cuticle of metascutal, scutellar and abdominal sclerites, as well as small area immediately an-

TABLE I

Blepharicera, Tenuipes Group. Size of pupae (mean lengths in mm). N.a. = not available.

	♂	♀
B. capitata	n.a.	n.a.
B. cherokea	n.a.	n.a.
B. diminutiva	n.a.	n.a.
B. similans	3.62	4.70
B. tenuipes	4.37	5.04
B. williamsae	4.74	5.65
B. species F	n.a.	4.7

terior to branchial lamellae on branchial sclerite, finely and densely papillate; remainder of dorsum smooth or weakly wrinkled. Branchiae parallel, widely separated; posture erect, composed of 4 elongate, apically rounded, rigid plates; all plates of equal length; internal pair more weakly sclerotized than external. Antennal cases of both sexes extending to less than half the length of wing cases.

The material for this project includes one specimen which deviates from all the others in the form of the tergites of abdominal segments I-V. These sclerites, instead of forming a flat arch across the midline, possess a low, cone-shaped prominence anteromedially; a similar, but lower and broader prominence arises from the scutellar sclerite. The processes are presumedly homologous to those on the mid dorsum of "Larva F."

TAXONOMY-LARVAE

Six types of larvae are distinguishable in the material assembled for this study. Because none could be definitely associated with adults, their identities are tentative and in 3 cases still so uncertain that they can only be guessed.

DESCRIPTION

GENERAL.—Typical in basic structure for genus *Blepharicera. Size.*—Body length (prepupal) 5-7 mm. Width of head capsule 1.2-1.5 mm. *Color.*—Pigmentation usually pale, yellowish, sometimes medium brown. Sclerotized structures medium to dark brown. *Structure.*—Intercalary segments present. Head capsule with complete incision in lateralia. Antennae very short and with two sclerotized rings. Dorsal pseudopods absent. No dorsal spines, sclerotized plates or processes of any kind present (one species with middorsal coniform swellings). Ventrolateral gills with 7 filaments (6 occasionally on terminal division). *Chaetotaxy.*—Integument dorsally set with numerous secondary, coniform or claviform sensilla, primary sensilla recognizable as follows: tp M-T, members of pairs disjunct; ss P-T, that of P out of line laterad with those of M-T; st, inner tp, and dpod I-VII.

LARVA A
(TENTATIVELY *B. TENUIPES*)

DESCRIPTION

Fourth instar larva (Fig. 30): Body length 6.9 mm; head width 1.48 mm. Secondary dorsal sensilla short, elongate-claviform; arranged in two irregular transverse rows on trunk divisions and abdomen I; a single row on each thoracic segment; rows confluent and sensilla general laterally, some setiform sensilla mixed. Recognizable primary sensilla all setiform except t P-M which are subchaetiform.

MATERIAL (Fig. 41)

Larvae (and accompanying immature pupae).—*CANADA*. NEWFOUNDLAND. Baie Verte River, 23 June 1971, S. W. Frost (4 larvae:CNC). ONTARIO, *Carleton County*. Cunningham and Riopelle Islands, Remic Rapids, 18 May, 6 June 1949 (3 pupae, 14 larvae:CNC). *Renfrew County*. Petawawa, rapids belong Highway 17 bridge, 28 April 1959, G. E. Shewell (5 pupae, 3 larvae:CNC). *Timiskaming County*. Kelly Creek, Highway 101, 28.8 mi W Timmins, 23 May 1972, ROM field party No. 720183 (14 larvae:ROM). *Wentworth County*. Spencer Creek, below falls, Ontario Railway Station, Dundas, 13 May 1954 (2 pupae, 6 larvae:USNM). QUEBEC, *Saguenay County*. Baie-Comeau, 11 June 1963, H. C. Connell (15 larvae:CNC). STATE and *County* UNKNOWN. Bug River Rapids, 21 June 1951 (8 pupae, 5 larvae:USNM). *UNITED STATES*. MARYLAND, *Frederick County*. Catoctin Creek, 1 mi N Little Catoctin, Harmony, 30 May 1958, P. H. Freytag (1 larva:OSU). *Garrett County*. Savage River at Big Run Campground, 17 April 1968, Yamamoto & Odum (1 larva:ROM).

REMARKS

Determination of this larva seems fairly certain because of its wide occurrence in areas occupied exclusively by *tenuipes*. A significant locality in this respect is Ithaca, New York, where the numerous collections of all stages have never contained any deviant forms.

LARVA B
(TENTATIVELY *B. SIMILANS*)

DESCRIPTION

Fourth instar larva (Fig. 33): Body length 5.1 mm; head width 1.22 mm. Secondary dorsal sensilla short, extremely capitate (almost spherical in some), the largest apically dentate; arranged in two irregular transverse rows on trunk divisions and abdomen I; a single row on each thoracic segment; rows confluent laterally and where sensilla setiform mixed and general. Usually one conspicuously large, secondary claviform sensillum in dorsolateral area. Recognizable primary sensilla all setiform.

MATERIAL (Fig. 40)

Larvae (and accompanying immature pupae).—*CANADA*. QUEBEC, *Brome County*. Sutton Mountain Creek, 11 July 1929, G. S. Walley (19 larvae:CNC). *UNITED STATES*. MAINE, *Somerset County*. Pleasant Pond Stream, Caratunk, 24 June 1966, R. & D. Koss (78 larvae:JH). MARYLAND, *Garrett County*. "CCXXXIV falls, muddy creek", 25 August 1965, J. Glime (1 larva:USNM). MASSACHUSETTS, *Berkshire County*. Bashbish Creek, 6 July 1950, A. Stone (4 pupae, 12 larvae:USNM). NEW HAMPSHIRE, *Coos County*. Creek on way to Glen

House, 18 July 1929, G. S. Walley (1 pupa, 3 larvae:CNC). NORTH CAROLINA, *Jackson County*. 3 mi E Balsam, 3400 feet, 11 July 1974, D. & M. Davis (12 larvae:USNM). *Swain County*. Deep Creek at Deep Creek Campground, Great Smoky Mountains National Park, Bryson City, 21 May 1970, Wiggins & Yamamoto No. 700365 (10 larvae:ROM). TENNESSEE, *Sevier County*. Gatlinburg, fork Little Pigeon River, 27 May 1934, T. H. Frison (3 larvae:INHS). Greenbrier Cove, Great Smoky Mountains National Park, 18 May 1952, H. B. Reed (53 larvae:UT). VIRGINIA, *Giles County*. Big Stony Creek, Kimballton, 26 May 1962, C. V. Covell (1 pupa, 3 larvae:UL). Sinking Creek, 29 May 1941, A. Stone No. 111 (6 pupae, 10 larvae:USNM). *Highland County*. Cowpasture River, 3 mi N Williamsville, 27 July 1974, M. M. Davis (1 pupa, 11 larvae:USNM). *Madison County*. White Oak Creek, Shenandoah National Park, 24 June 1951, B. O. Burks (8 larvae:USNM).

REMARKS

Identification of this form is fairly certain and based upon several widely spaced collections of larvae accompanying pupae with clearly recognizable pharate adults (see MATERIAL under account of *similans*).

LARVA C
(SPECIES UNDETERMINED)

DESCRIPTION

Fourth instar larva (Fig. 35): Body length 6.4 mm; head width 1.33 mm. Secondary dorsal sensilla long, attenuo-claviform; arranged generally over each division but tending to form transverse rows especially on thoracic segments; also fewer across trunk segments slightly posterior to a mid-transverse line; laterally mixed with setiform sensilla. Recognizable primary sensilla all setiform.

MATERIAL (Fig.43)

Larvae (and accompanying immature pupae).—*UNITED STATES*. GEORGIA, *Lumpkin County*. Hightower River, 11 April 1941, A. Stone No. 21 (5 larvae:USNM). *Union County*. Vogel State Park, 11 April 1941, A. Stone No. 18 (9 larvae:USNM). MARYLAND, *Frederick County*. Cunningham Falls State Park, 15 April 1973, P. & P. Spangler (23 larvae:USNM). *Garrett County*. Ginsend Run, 4 May 1965, J. Glime (2 larvae:MSU). Sang Run Crossing, Sang Run Road, 17 April 1968, Yamamoto & Odum (6 larvae:ROM). VIRGINIA, *Alleghany County*. Tributary Jackson River beside Route 220 just N Covington, 18 April 1968, Yamamoto & Odum (1 larva:ROM). Potts Creek, 3 mi SW Jordan Mines, 18 April 1968, Yamamoto & Odum (9 larvae:ROM). *Amherst County*. Tributary of James River beside Blue Ridge Parkway near junction with Route 501, 19 April 1968, Yamamoto & Odum (3 larvae:ROM). *Bath County*. Stream in Blowing Springs Recreation Area on Route 39, 18 April 1968, Yamamoto & Odum (6 larvae:ROM). *Floyd County*. Little Indian Creek, Copper Valley, 24 April 1966, P. & B. Wygodzinsky (6 larvae:AMNH). *Giles County*. Big Stony Creek, Kimballton, Station 2, 14 April, 5 May 1962, C. V. Covell (4 pupae, 25 larvae:UL). Sinking Creek, 29 May 1941, A. Stone No. 111 (1 larva:USNM). *Green County*. Swift Run, 5 mi W Standardsville, Highway Route 33, 17 May 1970, R. W. Koss (10 pupae, 15 larvae:JH). Lydia, 20 April 1938, R. Burks (3 larvae:INHS). *Madison County*. Oak Creek, Shenandoah National Park, 6 May 1951, B. D. Burks (5 larvae:USNM). White Oak Canyon, Skyline Drive, 6 May 1951, Burks & Sommerman (2 larvae:USNM). *Rappahannock County*. Thornton River, Shenandoah National Park, 15, 20, 26 April 1961, O. & R. Flint (1 pupa, 29 larvae:USNM). *Shenandoah County*. Passage Creek, Camp Roosevelt, 21 May 1973, S. Fiance (3 larvae:USNM). STATE and *County* UNKNOWN. Treasler Run, Aitkin Farms, 29 April 1951, S. W. Frost (9 larvae:PSU).

REMARKS

The distribution of this form coincides approximately with that of the atypical type of *tenuipes* (see VARIATION under that species) and may represent its larva. If this proves to be the case, its distinctiveness and constancy detract from the hypothesis of hybrid origin for that type and suggest that a separate species or subspecies is present.

LARVA D
(TENTATIVELY *B. WILLIAMSAE*)

DESCRIPTION

Fourth instar larva (Fig. 31).—Body length 6.7 mm; head width 1.43 mm. Secondary dorsal sensilla short, lanceolate; arranged generally over each division but tending to form transverse rows on thoracic segments; mixed with chaetiform sensilla only near lateral margin. Recognizable primary sensilla all setiform except t P-I and st V-VI which are cylindriform. Specimens are often more darkly pigmented dorsomesally than laterally and present a longitudinally banded appearance.

MATERIAL (Fig. 42)

Larvae (and accompanying immature pupae).—*UNITED STATES*. GEORGIA, *Dawson County*. Amicalola Falls, 11 April 1941, A. Stone (2 larvae:USNM). *Gilmer County*. Little Turnip Town Creek, Walnut Mountain Development, 13 March 1974, H. D. Pratt (6 pupae, 6 larvae:HDP). *Rabun County*. Tallulah River at Tallulah River Campground, S Tate City, 17 May 1970, Wiggins & Yamamoto (1 larva:ROM). *Union County*. Chestatee River, 11 April 1941, A. Stone (1 larva:USNM). NORTH CAROLINA, *McDowell County*. Woodlawn, 23 March 1940, Frison, Mohr & Hawkins (3 larvae:INHS). *Swain County*. New Found Gap, 3560 feet, 28 May 1934, T. H. Frison (6 pupae, 6 larvae:INHS). SOUTH CAROLINA, *Oconee County*. Howard Creek, 6 February 1976, R. L. Green & D. A. Braatz (5 larvae:LACM). TENNESSEE, *Sevier County*. Campground near Chimneys, Great Smoky Mountains National Park, 11 May 1944, Frison & Ross (16 larvae:INHS). Stream 10.2 mi E Gatlinburg entrance on Route 441, 20 May 1970, Wiggins & Yamamoto No. 700361 (10 larvae:ROM). Greenbrier Cove, Great Smoky Mountains National Park, 13 February 1938, A. C. Cole (47 larvae:UT); 18 March 1939, A. C. Cole (2 larvae:INHS). Small stream 0.8 mi W New Found Gap on Route 441, 20 May 1970, Wiggins & Yamamoto No. 700359 (2 larvae:ROM).

REMARKS

Coincidence of large size and larval collections with the adults of *williamsae* strongly suggest the identity of that species with this form.

LARVA E
(SPECIES UNDETERMINED)

DESCRIPTION

Fourth instar larva (Fig. 32).—Body length 5.9 mm; head width 1.64 mm. Secondary dorsal sensilla all setiform (except for occasional claviform shapes on thoracic segments in some specimens); arranged in two irregular rows on trunk divisions and abdomen I; a single row on each thoracic segment; rows confluent and sensilla general laterally. Recognizable primary sensilla all setiform and similar to secondary sensilla except for larger size.

MATERIAL (Fig. 44)

Larvae.—*CANADA*. ONTARIO, *Parry Sound County*. Cashman Creek crossing Highway 518 at Sand Lake, 1 June 1972, ROM field party, No. 720212 (1 larva:ROM). *UNITED STATES*. MINNESOTA, *Lake County*. Split Rock Creek, 2 mi W Lake Superior, 16 May 1952, J. Gerberich (6 larvae:OSU). VIRGINIA, *Giles County*. Big Stony Creek, Station 2, Kimballton, 5 May 1962, C. V. Covell (1 larva:UL). STATE and *County* UNKNOWN. Stillwater Creek, 13 June 1961 (1 larva:USNM).

REMARKS

I have no idea of the identity of this form. It is sympatric only with *tenuipes*, but since the larva of that species is known, larva E would appear to belong to an unknown entity.

LARVA F
(SPECIES UNDETERMINED)

DESCRIPTION

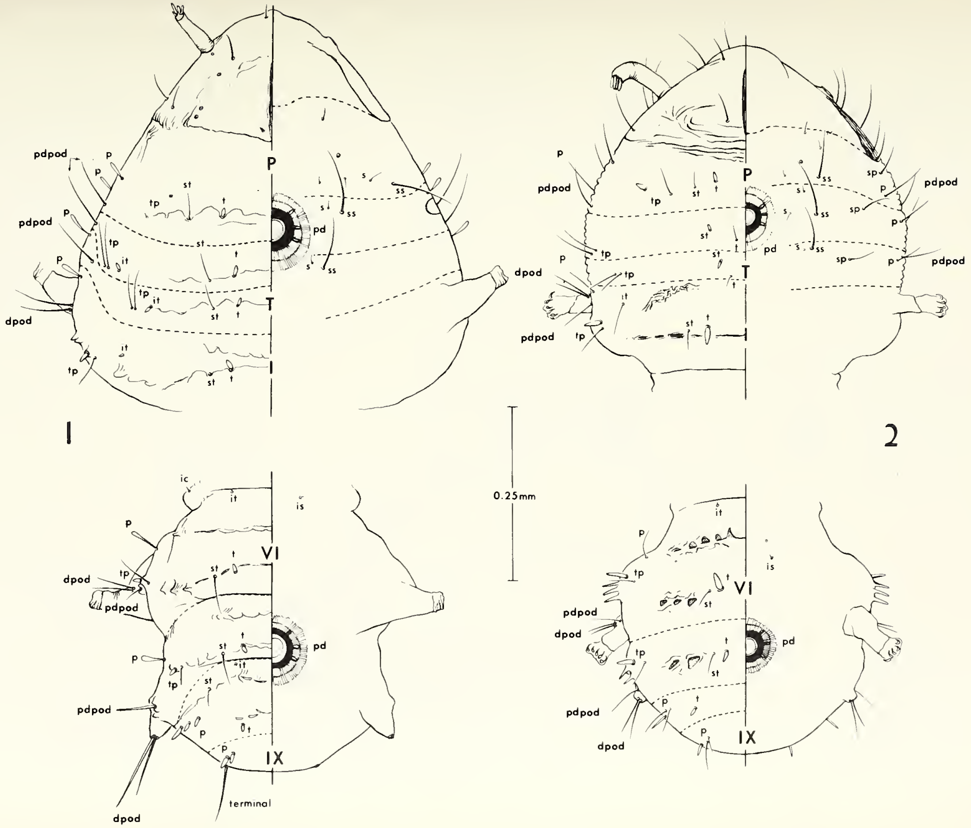
Fourth instar larva (Figs. 34, 36).—Body length 5.8 mm; head width 1.25 mm. A conspicuous median conical protuberance on each trunk division and abdomen I. Posterolateral lobes of terminal division poorly developed, terminal incision very shallow. Secondary dorsal sensilla claviform; arranged generally on all divisions except for 4-6 larger sensilla grouped tightly at apex of each coniform process; lateral sensilla mostly setiform. Recognizable primary sensilla well marked, all setiform except for t P-T and t V-VI which are cylindriform.

MATERIAL (Fig. 44).

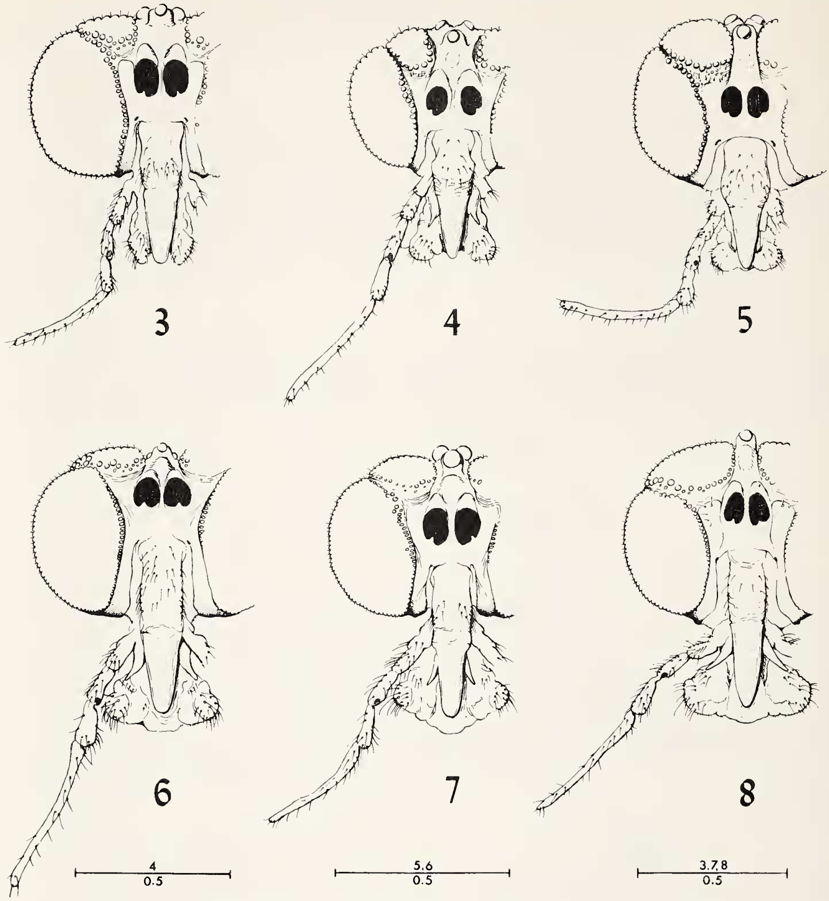
Larvae (and accompanying immature pupa).—*CANADA*. NEW BRUNSWICK, *Charlotte County*. Saint Stephen, 27 June 1965, G. E. Shewell (1 pupa, 2 larvae:CNC). *UNITED STATES*. GEORGIA, *Lumpkin County*. Hightower River, 11 April 1941, A. Stone No. 21 (11 larvae:USNM). MAINE, *Somerset County*. Pleasant Pond Stream, Caratunk, 24 June 1966, R. & D. Koss (1 larva:JH). NORTH CAROLINA, *Avery County*. Linville River at Linville Falls Campground, Blue Ridge Parkway, 22 May 1970, Wiggins & Yamamoto No. 700369 (11 larvae:ROM). *Swain County*. Deep Creek at Deep Creek Campground, Great Smoky Mountains National Park, Bryson City, 21 May 1970, Wiggins & Yamamoto No. 700365 (2 larvae:ROM). Noland Creek, Great Smoky Mountains National Park, 24 May 1974, R. L. Green (1 larva:LACM). VIRGINIA, *Bath County*. Stream in Blowing Springs Recreation Area on Route 39, 18 April 1968, Yamamoto & Odum (1 larva:ROM).

REMARKS

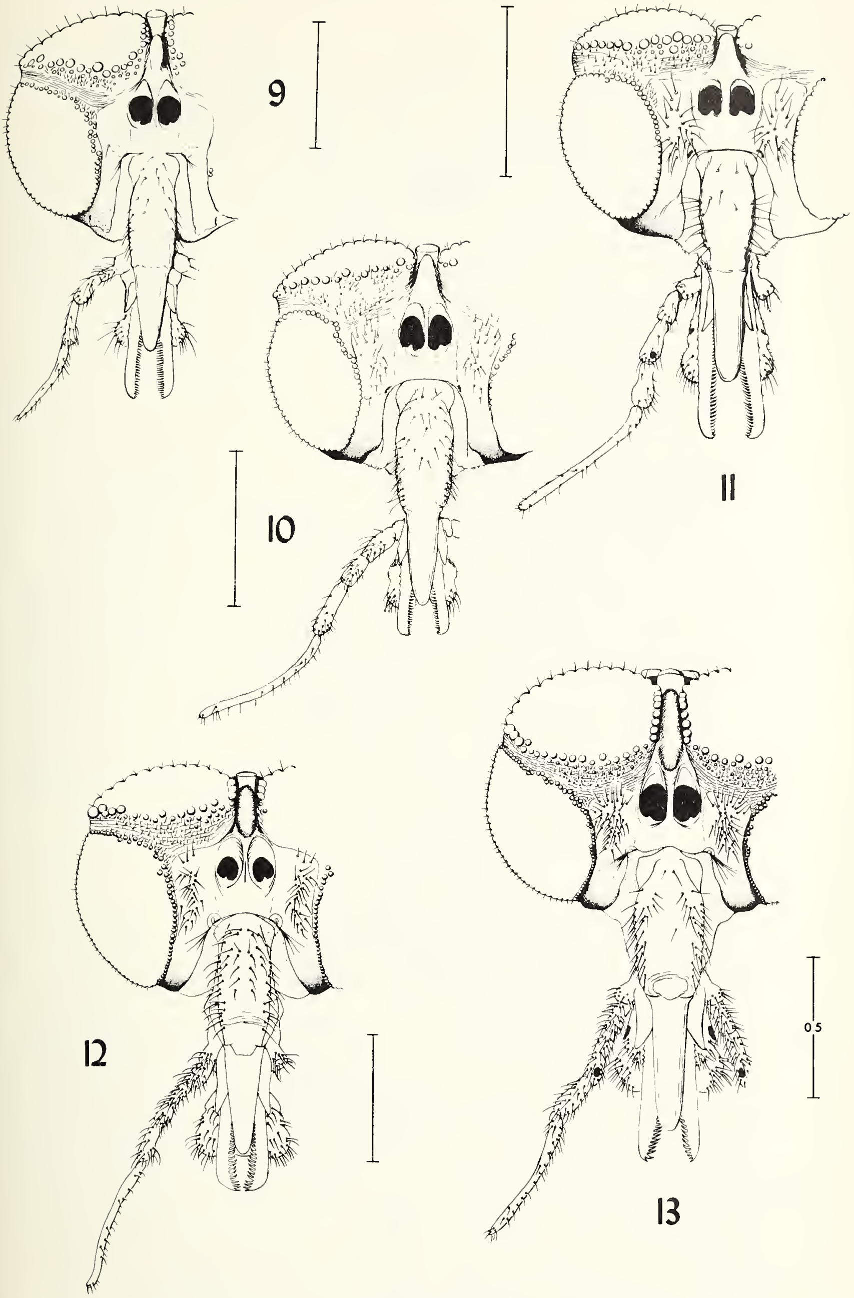
Unfortunately the female dissected from the single pupa available of this form was immature and not identifiable. Because of its great latitudinal range it seems unlikely that it belongs to either *capitata*, *cherokea* or *diminutiva*, all species now known to have restricted distribution. Possibly another new species is indicated.



FIGURES 1-2: Chaetotaxy of first instar larvae: 1. *Agathon comstocki*. 2. *Neocurupira chiltoni*. See section on TAXONOMIC CHARACTERS for explanation of abbreviations.



FIGURES 3-8: Anterior view of head capsules of male *Blepharicera:* 3. *B. capitata.* 4. *B. cherokea.* 5. *B. diminutiva.* 6. *B. similans.* 7. *B. tenuipes.* 8. *B. williamsae.*



FIGURES 9-13: Anterior view of head capsule of female *Blepharicera:* 9. *B. capitata.* 10. *B. cherokea.* 11. *B. diminutiva.* 12. *B. similans.* 13. *B. williamsae.*

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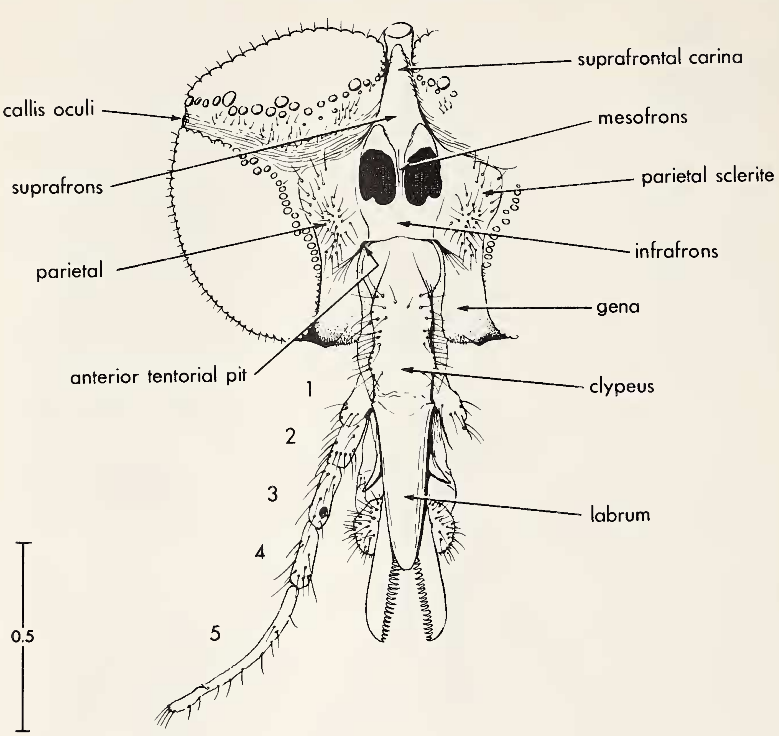

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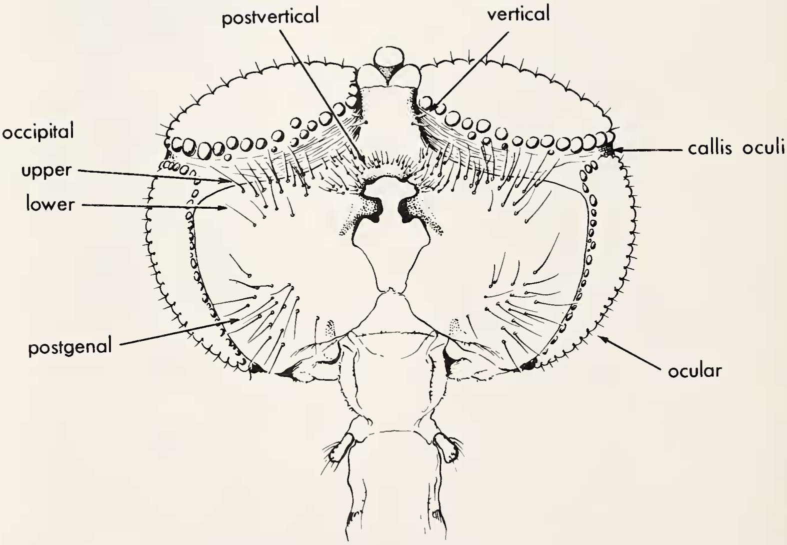
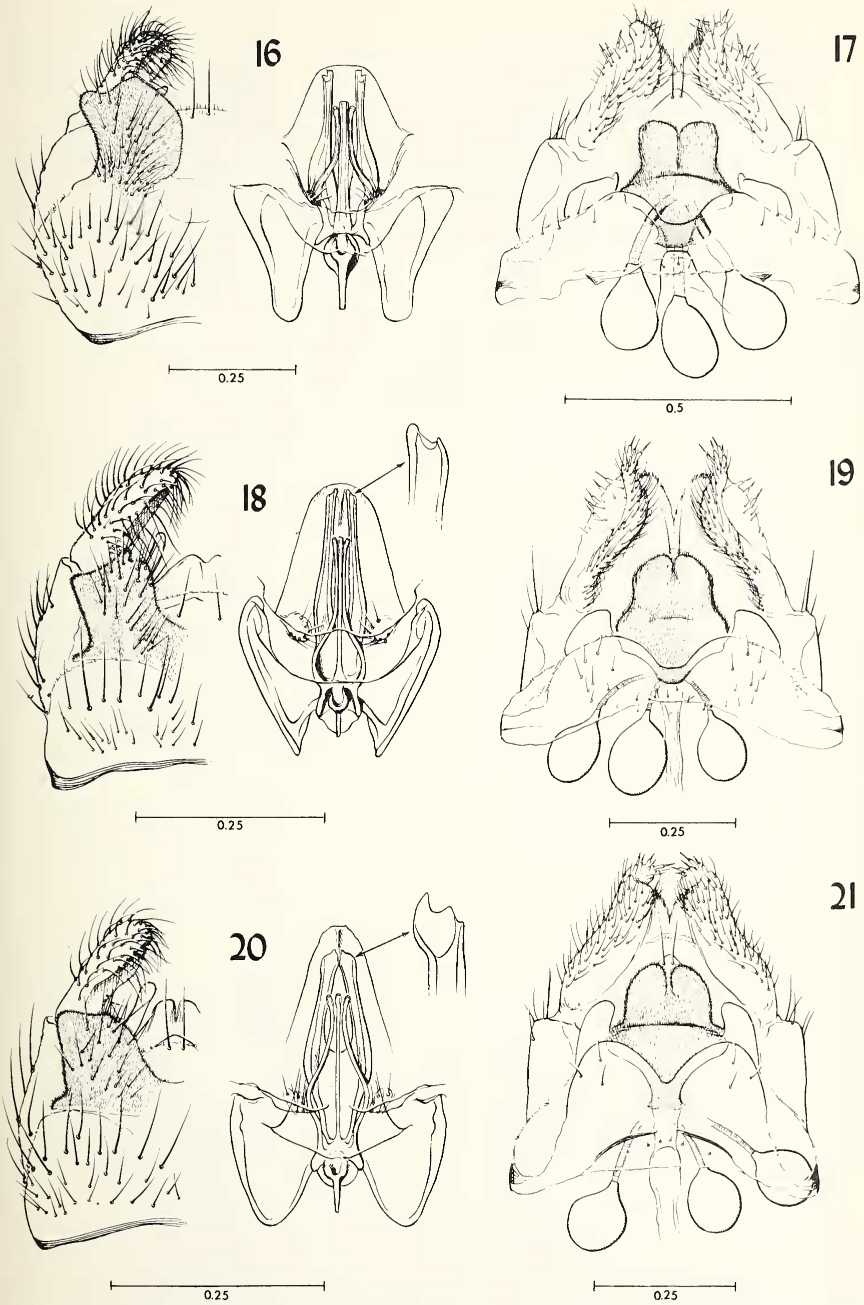
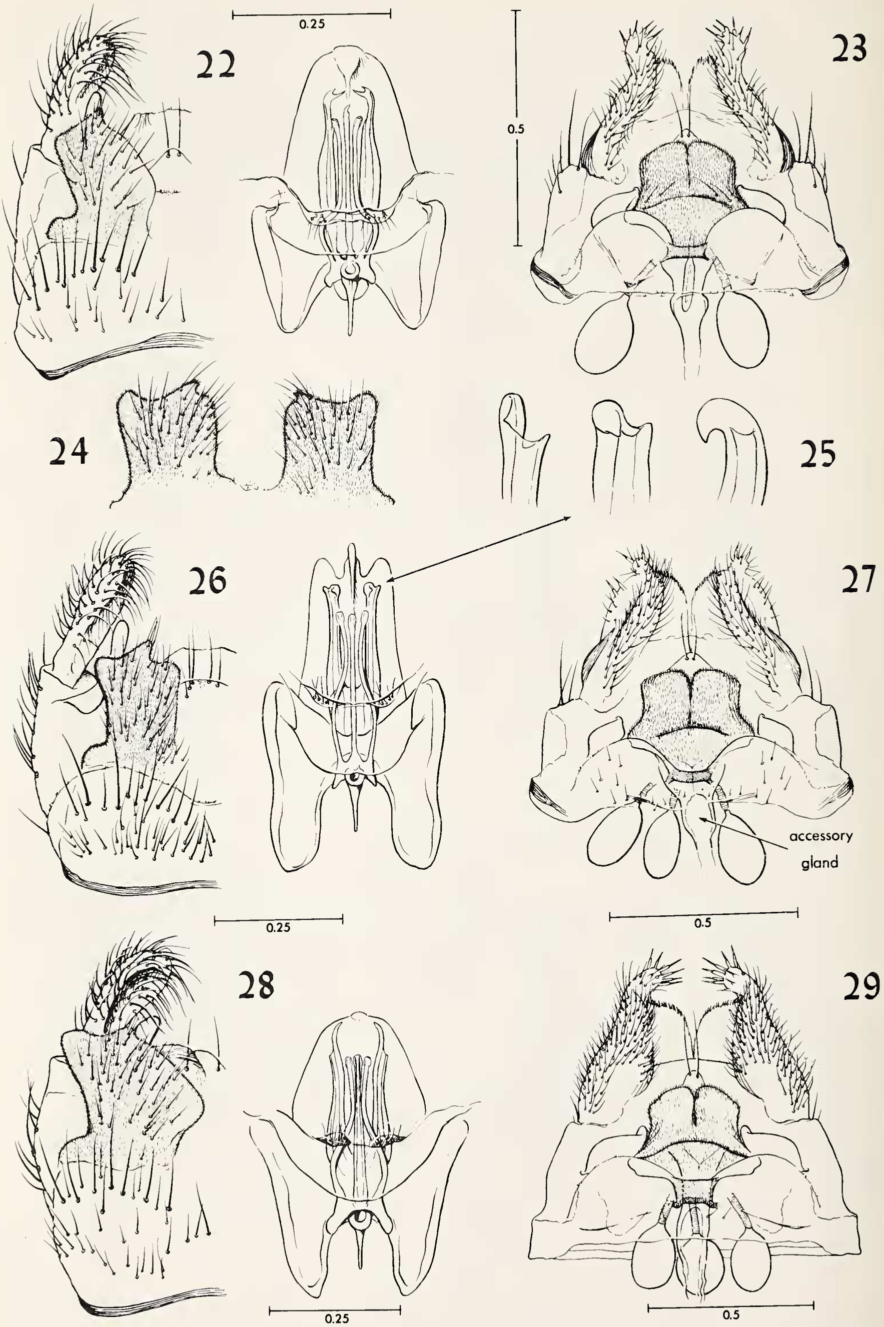


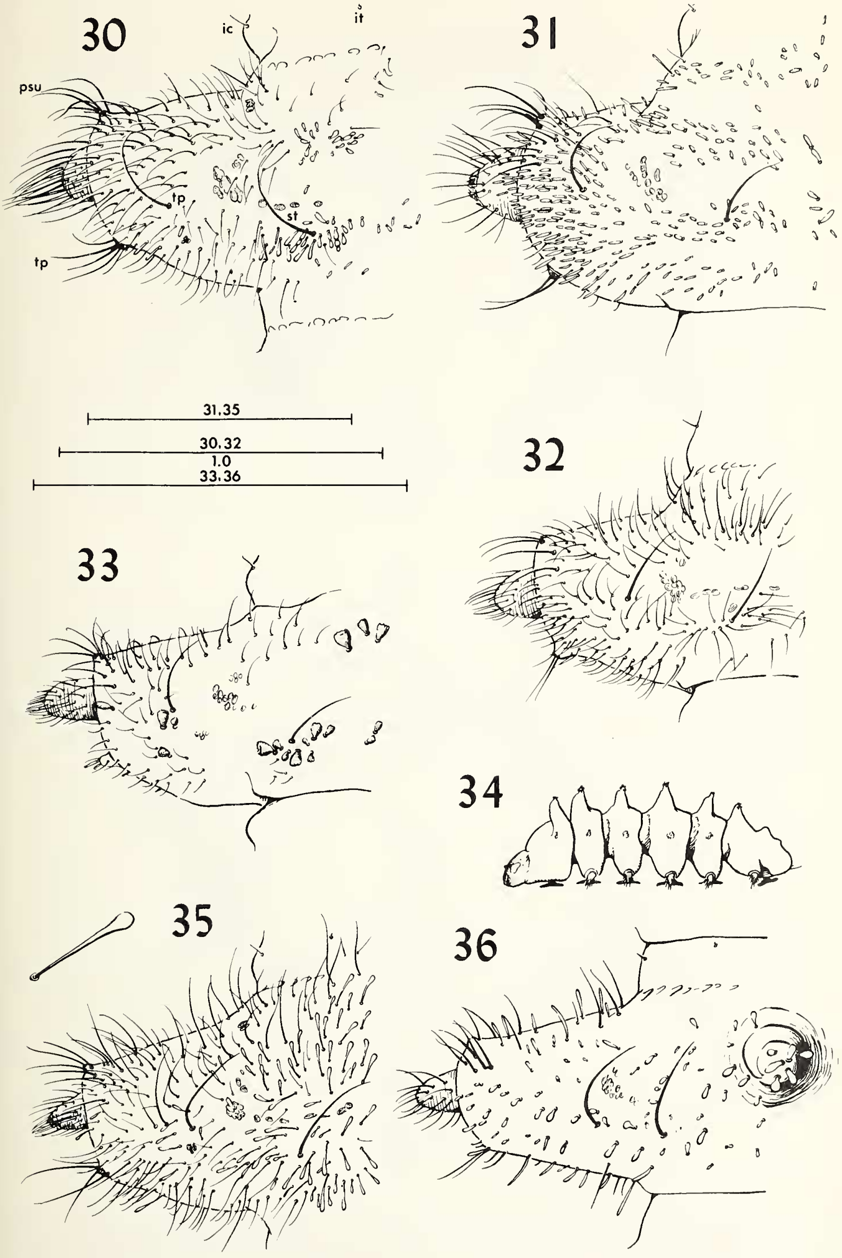
FIGURES 14-15: Terminology of head capsule, *Blepharicera tenuipes,* female: 14. Anterior view. 15. Posterior view, mouthparts omitted.



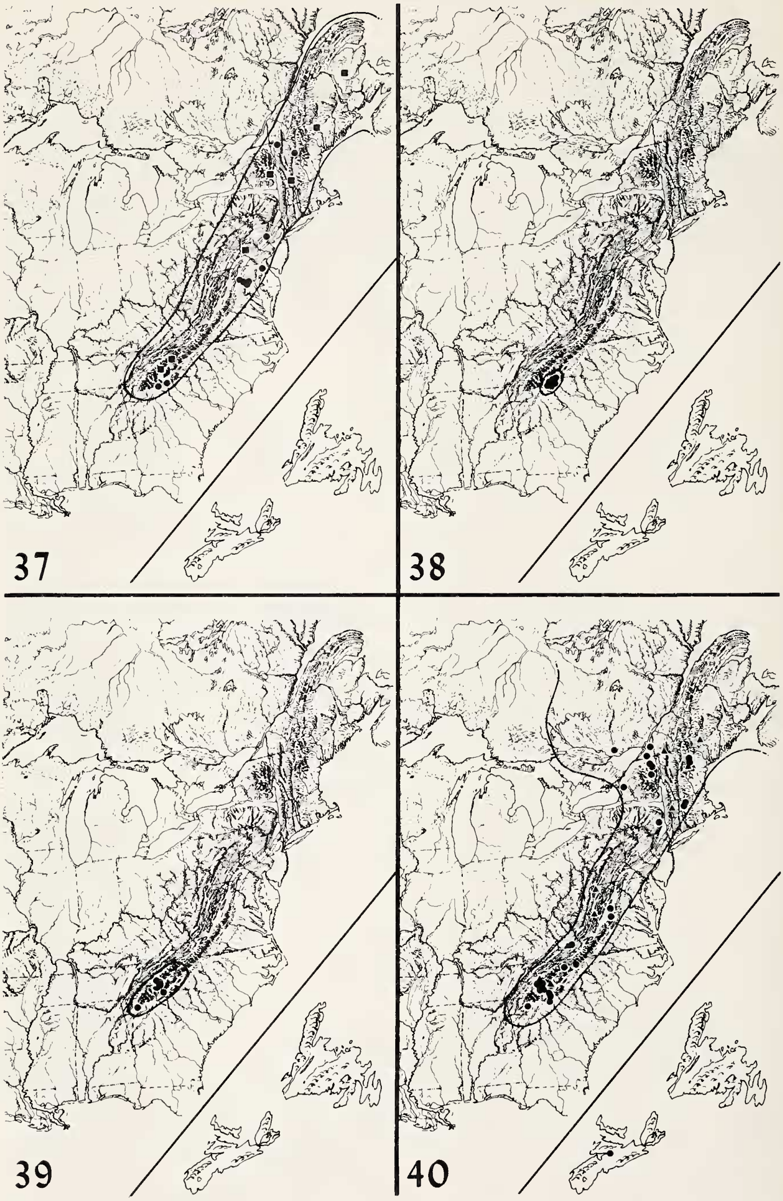
FIGURES 16-21: Male (left) and female (right) genitalia of *Blepharicera:* 16-17. *B. capitata*. 18-19. *B. cherokea*. 20-21. *B. diminutiva*.



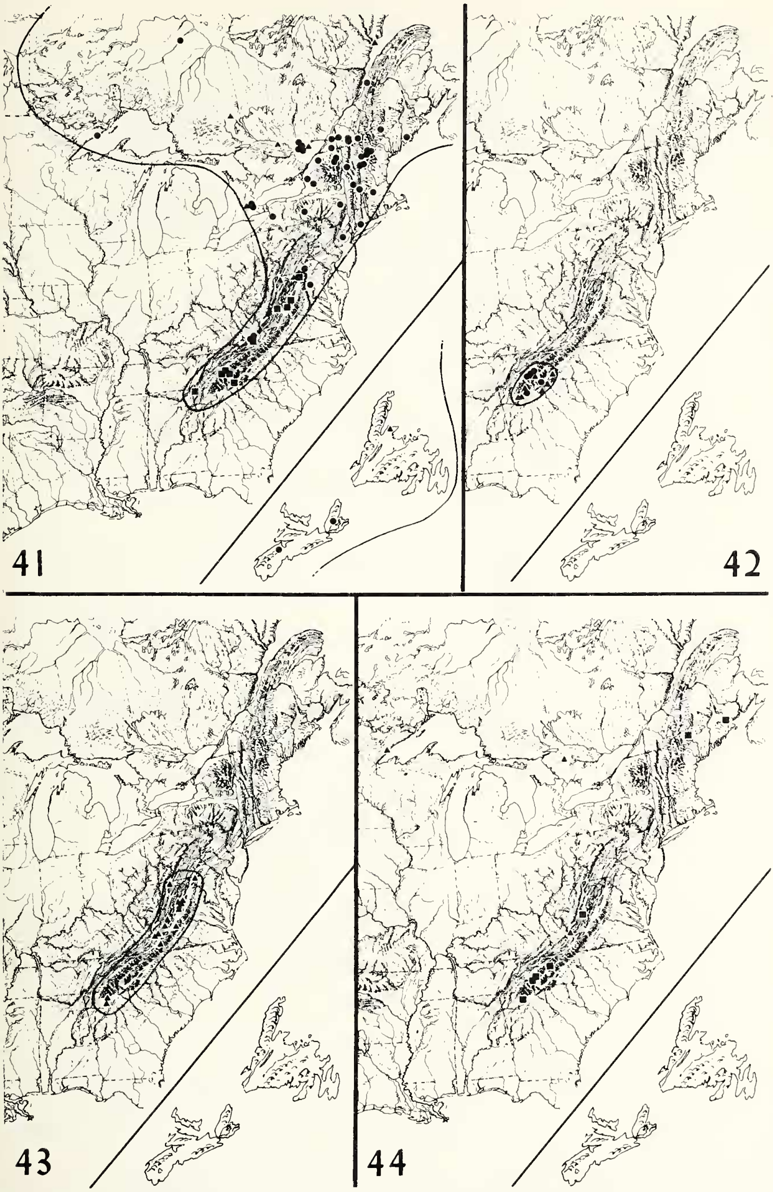
FIGURES 22-29: Male (left) and female (right) genitalia of *Blepharicera* (continued): 22-23. *B. similans*. 24-27. *B. tenuipes* (24. Ninth tergite lobes of "southern type"; 25. Three views of apex of paramere of male genitalia). 28-29. *B. williamsae*.



FIGURES 30-36: Fourth instar larvae of *Blepharicera*, 34. lateral view of Larva F (species undetermined), remainder dorsal view of left side of third abdominal segment showing details of chaetotaxy. 30. Larva A (probably *tenuipes*). 31. *B. williamsae*. 32. Larva E (species undetermined). 33. Larva B (probably *similans*). 35. Larva C (species undetermined). 36. Larva F (species undetermined).



FIGURES 37-40. Distribution of *Blepharicera* in eastern North America. Points indicate loci of collections, line encloses probable total range. 37. Typical *B. capitata* (dots) and "separata" type (squares). 38. *B. diminutiva*. 39. *B. cherokea*. 40. *B. similans* adults (dots) and larvae (triangles).



FIGURES 41-44. Distribution of *Blepharicera* in eastern North America (continued). Points indicate loci of collections, line encloses probable total range. 41. Typical *B. tenuipes* adults (dots), southern type (squares) and larvae (triangles). 42. *B. williamsae* adults (dots) and larvae (triangles). 43. Larva C. 44. Larva E (triangles and larva F (squares).

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This study is based on 1869 specimens (773 adults, 1096 larvae and pupae). For the use of this material I wish to acknowledge the following repositories (listed alphabetically by the acronym used in citing specimens in the text above) and thank their respective curators who kindly arranged loans and provided much information:

AMNH - American Museum of Natural History, Pedro Wygodzinsky.
ANSP - Academy of Natural Sciences of Philadelphia, Harold Grant (deceased).
BMNH - British Museum, Natural History, Paul Freeman.
CAS - California Academy of Sciences, Paul H. Arnaud.
CNC - Canadian National Collection, B. V. Peterson.
CPA - Private collection of Charles P. Alexander, Amherst, Massachusetts.
CU - Cornell University, L. L. Pechuman.
DPC - Duke Power Company, Environmental Laboratories. R. Lynn Green.
HDP - Private collection of Harry D. Pratt, Atlanta, Georgia.
INHS - Illinois Natural History Survey, R. T. Allen.
JH - Johns Hopkins University, Richard Koss.
KS - Kansas State University, Norman Marston.
KU - University of Kansas, Snow Entomological Museum, George W. Byers.
LACM - Natural History Museum of Los Angeles County.
MCZ - Harvard University, Museum of Comparative Zoology, Philip J. Darlington.
MMU - McMaster University.
MSU - Michigan State University, Roland L. Fischer and Frederick W. Stehr.
OS - Oregon State University, J. D. Lattin.
OSU - Ohio State University, Paul Freytag.
PSU - Pennsylvania State University.
ROM - Royal Ontario Museum, Glenn B. Wiggins.
UCR - University of California, Riverside, Saul Frommer.
UL - University of Louisville, Charles V. Covell, Jr.
USNM - U.S. National Museum of Natural History Collection, Alan Stone, F. Christian Thompson, and W. W. Wirth, Agricultural Research Service, United States Department of Agriculture.
UNH - University of New Hampshire, J. G. Conklin.
UT - University of Tennessee, Arthur C. Cole, Jr.

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